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ABSTRACT

One of a series of educational packages designed for implementation either in a workshop atmosphere or through individual study, this Hot Topic guide presents a variety of materials to assist educators in designing and implementing classroom projects and activities centering on the topic of computers and writing. The Hot Topic guide contains guidelines for workshop use; an overview/lecture on computer-assisted instruction in writing; and six focused ERIC documents and articles (from scholarly and professional journals). Contains a 27-item annotated bibiliography of items in the ERIC database on computers and writing. (RS)

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HOT TOPIC

GUIDE 33

Computers and Writing

Revised Edition

This Hot Topic Guide is one of a series of educational packages designed for implementation either in a workshop atmosphere or through individual study. With the comments and suggestions of numerous educators, the Hot Topic Guide series has evolved to address the practical needs of teachers and administrators. As you take the time to work through the contents of this guide, you will find yourself well on the way to designing and implementing a variety of classroom projects and activities centering on this topic.

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HELPFUL GUIDELINES FOR WORKSHOP USE

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Computer-Assisted Instruction in Writing
by Marge Simic

ARTICLES AND ERIC DOCUMENTS

- The Effect of Computer-Based Instruction on Writing at an Elementary Level
- Too Early to Judge the Impact?: Computer-Assisted Writing Instruction
- Early Childhood Classrooms and Computers: Programs with Promise
- The Impact of Computers on the Writing Process
- Literacy with the Computer
- A Collaborative Writing Project Using the Worldwide Web

UPDATED BIBLIOGRAPHY

A collection of selected references and abstracts obtained directly from the ERIC database.

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Planning a Workshop Presentation
Worksheet

Major concepts you want to stress in this presentation:

1) _____

2) _____

3) _____

Are there additional resources mentioned in the Bibliography that would be worth locating? Which ones? How could you get them most easily?

_____

_____

Are there resource people available in your area whom you might consult about this topic and/or invite to participate? Who are they?

_____

_____

What would you like to see happen in participants' classrooms as a result of this workshop? Be as specific as possible.

_____

_____

_____

_____

Plans for followup to this workshop: [peer observations, sharing experiences, etc.]

_____

_____

Agenda for Workshop
Planning Sheet

Introduction/Overview:

[What would be the most effective way to present the major concepts that you wish to convey?]

_____

_____

_____

Activities that involve participants and incorporate the main concepts of this workshop:

1) _____

_____

_____

_____

2) _____

_____

_____

_____

Applications:

Encourage participants to plan a mini-lesson for their educational setting that draws on these concepts. [One possibility is to work in small groups, during the workshop, to make a plan and then share it with other participants.]

Your plan to make this happen:

_____

_____

Evaluation:

[Use the form on the next page, or one you design, to get feedback from participants about your presentation.]

End-of-Session Evaluation

Now that today's meeting is over, we would like to know how you feel and what you think about the things we did so that we can make them better. Your opinion is important to us. Please answer all questions honestly. Your answers are confidential.

1. Check (✓) to show if today's meeting was
   ❑ Not worthwhile ❑ Somewhat worthwhile ❑ Very worthwhile
2. Check (✓) to show if today's meeting was
   ❑ Not interesting ❑ Somewhat interesting ❑ Very interesting
3. Check (✓) to show if today's leader was
   ❑ Not very good ❑ Just O.K. ❑ Very good
4. Check (✓) to show if the meeting helped you get any useful ideas about how you can make positive changes in the classroom.
   ❑ Very little ❑ Some ❑ Very much
5. Check (✓) to show if today's meeting was
   ❑ Too long ❑ Too short ❑ Just about right
6. Check (✓) whether you would recommend today's meeting to a colleague.
   ❑ Yes ❑ No
7. Check (✓) to show how useful you found each of the things we did or discussed today.

   Getting information/new ideas.
   ❑ Not useful ❑ Somewhat useful ❑ Very useful

   Seeing and hearing demonstrations of teaching techniques.
   ❑ Not useful ❑ Somewhat useful ❑ Very useful

   Getting materials to read.
   ❑ Not useful ❑ Somewhat useful ❑ Very useful

Listening to other teachers tell about their own experiences.

❑ Not useful ❑ Somewhat useful ❑ Very useful

Working with colleagues in a small group to develop strategies of our own.

❑ Not useful ❑ Somewhat useful ❑ Very useful

Getting support from others in the group.

❑ Not useful ❑ Somewhat useful ❑ Very useful

8. Please write one thing that you thought was best about today:

9. Please write one thing that could have been improved today:

10. What additional information would you have liked?

11. Do you have any questions you would like to ask?

12. What additional comments would you like to make?

Thank you for completing this form.

Computer Assisted Instruction in Writing

by Marge Simic

Lecture

(All references are fully documented in the enclosed bibliography, or in a reference list following the lecture)

Two factors contributing to the change in writing instruction in the classroom have been the research investigating the way writing is taught and the computer. Research has found that most teachers are concerned with the final product of writing, but have little understanding of the process that successful writers use in creating the final product (Britton, et.al., 1975; Graves, 1983; Murray, 1984; Calkins, 1986; Hansen, 1987; Harste, et.al., 1988). Traditionally, students have been asked to produce compositions on demand, with little guidance on how to work through the steps that quality writing requires.

Proponents of the various writing models endorse writing as an on-going, multi-stage process, with equal emphasis given to each of the stages. Those who advocate the process approach believe that to communicate effectively, the student writer must first gather information and organize that information. Then writing begins, after which the writer critically evaluates and revises repeatedly to determine whether the sequencing, the content, the format, and the tone communicate the intended message.

Whether writing is taught by the process approach or by a traditional method, one of the barriers in producing good writers is that students must use pencil and paper to transcribe their thoughts and ideas. Many children are able to express thoughtful experiences, but have difficulty with handwriting; they labor over the first draft. To them, making revisions and recopying becomes an overwhelming burden. It is heartbreaking, as a teacher, to see a child, out of frustration and despair, tear up and throw away a thoughtful composition because repeated erasures have made holes in the paper. The original enthusiasm the student had for the writing assignment may evaporate in frustration and anger, causing the student to approach the next assignment with anxiety and apprehension. Students may refuse to explore new ideas if extensive reorganization requires hours of recopying. Some writers, especially young writers, will make only those changes that do not require recopying, regardless of how much the revision would improve their composition.

Educational computing has undergone a change of focus regarding how the microcomputer should be used in language arts, and especially in writing. No longer are computers seen as tutors and drillers. Instead, students and teachers now are realizing that the computer is a tool which should be used as it is

in business -- for handling information. A word processor can become the centerpiece for an effective computer-writing curriculum, encouraging early language production and providing students with early opportunities to connect reading and writing. When integrating advanced technology into any curriculum, the teacher must always be aware that it cannot "eliminate" the problems. It is not the intent of this lecture to interpret the computer as "virtually eliminating" the problems attendant to transcribing compositions with pencil and paper. Most teachers/users of word processing in the classroom will support the observation that children who read and write well tend to do well on the computer, and those who read and write with difficulty tend to experience the same difficulty on the computer. But with effective instruction and support from the teacher and peers, these students **can** experience success in writing through the use of a word processor.

While the word processor can be used for many applications in the language arts, these uses do not always take advantage of the computer's full potential. As a tool for practice in writing, the word processor's usefulness is unparalleled. Writing researchers have long advised that the key to fluent writing is to

write as much as possible. The key to exact writing is to revise repeatedly.

Newman (1984) discusses two important issues; the first is the relationship of recent research on learning to write to word processing. Newman says writing improves more "by experimenting with many aspects of the process at the same time" (p. 495) than by mastering separate skills and blending them. Word processing allows rapid alteration and manipulation of the text which result in more experimentation with language while writers sustain the mental images they are trying to capture. The search/replace capability encourages synonym substitution, and the immediate access to a clean copy stimulates further language play. In general, Newman says word processing has many advantages as a tool in writing instruction.

> It allows writers to become more willing to take risks, to be tentative about meaning longer, to consider organization and word choices more freely than ever before. What this means is that children (and adults, too) can learn a great deal about language and the writing process each time they engage in writing (p.495).

Newman's second major point is that there is a philosophical difference between using computers for drill and practice and using them for word processing. The difference lies in whether we are teaching children that they are controlled by the computer or that they control it. With drill and practice software,

the computer is in charge -- this software tells the user what to do, and it controls what is learned. With word processing, however, it is the learner who exerts control both in using the computer and in learning to write.

The word processor was designed for revising and manipulating language. One of the benefits of using the computer as a word processor is that proofreading and editing are easy. Inexperienced writers tend to make corrections at the word level. These students make corrections in grammar, spelling or vocabulary quickly and easily with no need for recopying. As writers become more experienced, they tend to make more complex changes. These "reorganizational" changes involve moving sentences and paragraphs around, reorganizing whole sections of articles, inserting new material, and discarding writing that no longer fits or serves.

For student writers, the act of recopying discourages large revisions. Proofreading and editing are easy with a word processor. Even a beginner can use the delete, strikeover, and insert functions to make simple changes. Students can make corrections in grammar, spelling, or vocabulary quickly and easily with no need for recopying. They can make more complex changes, such as changing the order of the sections in a paper or

adding passages written in another draft, with only a brief period of practice.

Ideally, freewriting also can be done at the computer. This would encourage students to engage in learning and self-discovery rather than focusing upon the mechanics of exact writing. The word processor can release the writer from restraints that inhibit the free flow of words and ideas. Students can feel free to take risks in their writing because they see that they can always change their minds.

Typically, however, there are not enough terminals available to allow for freewriting at a computer. Additionally, children (and adults, too) are usually unpracticed at composing and typing simultaneously. Frustration occurs and the pace is slow. Teachers can get around this problem by having children write on paper first. Then, at the word processor, students can "fine-tune" their papers. Concepts presented in the first draft can be examined for clarity and sufficient elaboration. Additional information and examples can be added, if necessary, to make ideas more concrete. Finally, the text can be checked for spelling errors, grammatical problems, and punctuation.

Before the use of word processing, this instructional model of writing was not implemented due to the amount of time involved

in extensive rewriting or retyping. Most teachers and students were not convinced that the benefits of the revision process were worth the time-consuming mechanics of repeated writing. Students were often apprehensive of even beginning to put their thoughts down on paper because of the work and time involved in making corrections.

The word processor has helped realize the advantages offered in process writing. Rewriting and revising are allowed to be the cognitive processes they should be, rather than being dominated by the mechanical aspects of actually putting words down on paper. Students learn to approach their writing errors from a different point of view by struggling to understand what causes problem phrases, sentences, or paragraphs.

Some students and adults need a printout for the final revising pass. This is fine as long as we continue to revise. Graves (1983) warns that once a neatly-printed draft is seen, children may be even less likely to revise. Children sometimes view the "typed" copy as final and official. Its professional appearance may lead children to assume that insignificant changes such as spelling corrections, together with a neatly-typed format, make a meaningful composition. A neatly-printed copy can disguise poor content, organization, and mechanics.

In addition to revising and editing, another benefit of using a word processor is that multiple copies can be printed for reading in peer-editing groups. Final copies can be displayed on a writing bulletin board or in a collection of writings without any student's work showing to disadvantage because of poor handwriting. By making the edited work "publishable," the student receives an additional benefit of having an audience other than the teacher.

The word processor offers great advantages, but also makes great demands. For the effective use of the word processor, the school must make a commitment to its use. In reality, the strongest commitment must be made by the individual classroom teacher. One obvious problem with using the word processor in the classroom is that the teacher must invest a great deal of time in teaching students to use it. Additionally, teachers must become familiar with the word processor themselves before using it in the classroom. Teachers must also decide when and how to give word processing instruction to their students.

If the entire class will use the word processor, whole-class instruction in its use is certainly most efficient. The ideal situation would be to place the teacher at the front of a computer laboratory room with large-screen monitors for demonstration purposes and one or two children sitting behind each computer.

Realistically, however, all students may not be ready to put their writing on the computer at the same time. This means that more time will need to be invested in reteaching those who were not ready to go directly to the computer and type.

Teacher's time is valuable. Therefore, it frequently is appropriate to consider using a peer-tutoring system instead. This requires a minimal investment of the teacher's classroom time, and it can be just as efficient. A peer-tutoring system can be set up by showing just one group how to use the word processing program. Then have each of these students teach at least one other student word processing on the computer. Teach the commands as the students need them. A small group of students can learn quickly from the teacher, or they can use the tutorial that comes with some word processing programs for back-up.

In any case, the key principle should be as much "hands-on" activity as possible. One does not learn to word process by listening to the teacher talk about it; one learns by doing it. If composition by computer is to become as natural an act for children as composition by handwriting, they must be allowed sufficient time to develop proficiency with the keyboard and with the specific word processing commands.

Teachers may be concerned with the fact that only one student at a time can utilize the word processor and printer. Many activities can be structured so as to allow "advisers" to work with the person typing. Moffett and Wagner (1983) have described this "sharing" process as central to writing instruction. Working in a group helps make writing an interactive activity. Children receive immediate feedback from others, making them aware of the need for clarity and for expressing their ideas so that they can be understood by others. This interactive feedback is extremely helpful to writers engaged in revision. It also provides each writer with experience in helping others revise their writings.

Another concern of the teacher may be that the word processor does not provide feedback concerning the quality of writing. The teacher or students must read the composition and suggest improvements. The function of the teacher during word processing changes from that of final critic to that of editor and mentor. The word processor offers the potential for cooperation not only between students but between teacher and students as well. As the teacher circulates to interact with students during the writing process, weaknesses can be observed and discussed while work is still on the screen, before it has been printed out on

paper. Teacher and student must work together to overcome writing obstacles while the writing is still in progress.

The cooperative give and take that is required in word processing/writing sessions can be an invaluable learning experience. Too few children see the composing and editing processes actually modeled for them. Teachers often seem to "magically" arrive at a correct mechanical revision or a revised wording. The students only see and hear the result, not the process. By sitting down with the writer and analyzing a problem, verbalizing each step of the solution to demonstrate the thinking involved as the revision is made, teachers and peers can communicate the essence of the writing process.

Composition teachers have recognized that word processing has revolutionizing writing. Revision, long advocated but ignored by both teachers and students as too mechanical and painful, is now possible by pressing a few keys. The potential of word processing for aiding composition is enormous.

We must recognize the central role of the teacher in composition and computer instruction. Computers do not change this. In all computer applications, whether the computer is used as a tool or simply as a device to which students can respond with problem solving or expressive activities, the teacher is needed

to provide feedback and to facilitate instruction. Indeed, the human component gives meaning to the tasks, providing the basis for interaction.

The word processor can be a powerful catalyst for helping students improve their writing competencies. If writing and revision can be made easier through effective writing instruction and word processing, then, hopefully, students will begin to write because they enjoy it rather than because they are forced to do so.

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The Effect of Computer Based Instruction on Writing at the Elementary Level

by Geraldine Jackiewicz, Rean College of New Jersey

April 1995 ED380802

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In the past few years writing skills of students in schools have been declining. Educators are faced with the task of preparing today's students for tomorrow's world, a world filled with technology. Teachers need to use all the resources available to them to encourage and enhance writing skills. Through writing, students intertwine the language arts- reading, writing, speaking, listening, and thinking, as they weave their ideas into stories they create.

It has been shown through standardized test scores that American youth exhibit an impoverished vocabulary, poor comprehension, negative attitudes and lack of motivation to learn.

Using the computer as a tool to teach writing skills will give the students motivation to write Students enjoy using computers therefore, writing on the computer should enhance their desire to write and improve their attitude towards writing. Writing is considered part of reading instruction, When children write about topics of interest to them, writing becomes an integral part of communication.

One of the four major stages of the writing process is revising. When the students use computers to write, revising or editing is as easy as the touch of a button. When using paper and pencil a whole page might have to be rewritten. Sharing and publishing is also a major stage of writing, After writing and revising material the computer will print out the work in a neat typewritten form to be shared with others.

Lee VerMulum made the following observations of her new high school writing class where computers were recently installed, 1. Student's time on task increased significantly. 2. The computers greatly facilitate students working at their own pace. 3. Students report an increased ease of writing even though they write and revise more than they did with paper and pencil. 4. Students attitudes toward writing are more openly pleasurable. 5. Increase in collaboration and cooperation in the classroom. 6. Decreased absences.

The use of the computer as a tool to teach writing is a relatively new idea in elementary school. Wepner (1987) states that word processing encourages and motivates students to create and experiment with communication and writing without having to worry about the mechanics of writing. Shaw (1987) states that computers allow students to create, organize, experiment and revise without having to rewrite the whole paper. This makes writing and rewriting easier. Wepner (1990) states that computers allow teachers to use software that helps students see relationships and connections between writing-reading and reading-writing.

Self and Wahlstrom (1989) state that classes that benefit most from computers are those that involve a good amount of writing. Schwartz (1989) states that word processing encourages students to take risks with writing. It helps the student formulate ideas and to edit and review the work. It helps students organize ideas and to see the structure of the essay before and after the fact. Mittricker (1989) states that the word processor helps in brainstorming, editing, moving text and deleting while still retaining information. The word processor makes revision fun and easy while eliminating poor handwriting skills.

Hypothesis

To provide additional comparative evidence, the following study was undertaken. It was hypothesized that fourth grade students using the computer to write will improve their writing skills when compared with a sample using pencil and paper for writing activities.

Procedure

Two fourth grade classes from one elementary school in an upper middle class neighborhood of New Jersey were used in this study. All students were asked to write a paragraph on the same topic, "What is your favorite place? Why?" These paragraphs were written with a pencil and paper. The paragraphs were used as the pre-test and graded holistically. Holistic scoring included four basic categories, content and organization, correct word usage, sentences structure and mechanics.

All students receive forty minutes of computer instruction each week. Thirty students from one fourth grade class, the experimental sample, were instructed in the use of the word processing program, Clarisworks. During their regular computer class the experimental sample did creative writing on the word processor, they wrote short stories, newspaper articles and poems. The writing assignments were assigned by their regular classroom teacher.

Twenty eight students from another fourth grade was designated the control sample. The control sample was taught computer skills other than word processing during their computer class. The only writing instruction they received was in their regular classroom and the assignments were completed with pencil and paper.

Before beginning the experiment the experimental sample was instructed how to delete and insert text, change fonts size and style, set tabs, save and print a file. The sample had some knowledge of keyboarding.

After three months all students were asked to write a paragraph on the same topic, "Who is your favorite person? Why?". The experimental sample used the computer to write their paragraphs while the control sample used pencil and paper. These paragraphs were graded holistically. A student questionnaire was also distributed to both groups at the conclusion of the study to determined the attitude of the students in both groups toward writing.

The scores from both paragraphs were analyzed according to holistic score and by the Fry readability formula. This data was then interpreted and examined for statistical significance using t tests.

Results

(Specific statistical results from this project have been deleted to save space. The full text of this document is available from ERIC: Call 1-800-ACCESS-ERIC)

Conclusions

The results of this study indicate there is a significant difference in the writing skills of fourth grade students using a computer to write when compared with a sample using pencil and paper for writing.

The validity of the results of the Fry Readability on immature writers work is questionable. Immature writers often have a paragraph of only one run-on sentence. The Fry Readability determines readability based on the average number of sentences and the average number of syllables in one hundred words, for this reason immature writers have a high readability

and the results would suggest that the experimental sample became significantly less mature in their written performance.

Computer Based Instruction and Writing: Related Literature

The word processor is the major computer tool for writers What should be emphasized is that it also teaches people about the composing process. Words are no longer "carved in stone" but written light, sometimes flashing, disappearing, reappearing, sliding, or rippling. New metaphors for the "look and feel" of writing are not trivial things. They suggest that the technology is teaching people a new set of reactions to associate with the composing process. (Marcus 1990). Word processors can help to make writing less traumatic by letting the writer be in control of the various skills of writing, while allowing a writer an opportunity to view his writing objectively. (Crozier 1986)

The computer is a powerful and flexible writing tool with certain physical characteristics and information processing capabilities that may affect the writing process and facilitate certain types of writing instruction. Computers can support the cognitive processes involved in planning, writing and revising text. (MacArthur 1988) All stages of writing are facilitated by the use of the word processor. During the drafting stage, the word processor's ability for text expansion from anywhere is that the text lends itself to trial and error experiments with style, chronology and mode of narration. Writers are prepared to make these tests using a word processor because of the ease with which they can be carried out and, if necessary, reversed. (Croizer 1986) The computer invites the students to produce a written record of their exploratory writing activities. According to Luchte(1987) the availability of hard copy printouts in the initial composing stage allows students to feel they have accomplished something substantial at a point in the process during which they feel tentative about getting something down.

Word processing may influence the writing process because of the ease of editing and revising. The ease of revision on the computer may encourage writers to make more revisions and improve their texts. It has been suggested that the editing capability can affect the entire composing process by encouraging authors to write freely, without concern for errors and awkward spots because it is so easy to make changes later. (MacArthur 1988.) Students appear to be more willing to consider revision and changes because they don't have to recopy the whole paper. Moore (1989) states one students view, "Instead of having to write reports freehand and getting writer's cramp, you can use the computer and save a lot of time, paper, and not have to scrub away spongy little eraser marks." Broad (1983) found that a word processor was most valuable in the revision process. The word processor made it easier to "delete, add, or move punctuation, words, sentences, paragraphs, or pages anywhere in the text. (Broad 1983:25) As a result of these features, the writer may be encouraged to revise more often and more adventurously."

Margaret Moore (1989) cites a pilot program used in a large Southeastern U.S. school district. The school district integrated the use of word processing technology with its developmental writing program. The forth and fifth grade students of this district used this program. In the fall, students and teachers were trained in the use of word processing technology. The pre-writing stage began in the classroom, the students had two days to brainstorm and organize their ideas. After students thoughts were organized, on day three, the students used the word processor the enter the story on the computer. The students worked with partners to assist one another with punctuation and spelling during this stage. Partners also conferred with one another about content on text. The teacher held mini conferences with the students to monitor their work. After 15 minutes the roles were

reversed and the writer became the reader and the reader became the writer. On the 4th day, students shared neat, legible copies of their stories with their peers editors. As the students shared their papers with others, they recognized the strengths of their stories identified problems within their stories, considered possible revision for their stories, or proofed their final version of their stories. Similar transactions between readers and writers continued until the writing piece was published.

Students appear to be more willing to consider revision and changes because they don't have to recopy the whole paper. Moore (1989) states one students view, "Instead of having to write reports freehand and getting writer's cramp, you can use the computer and save a lot of time, paper, and not have to scrub away spongy little eraser marks."

The findings of the pilot program indicated that students using word processors significantly improved the quality of their writing compared with students not using word processors. The computer screen facilitated discussions, editing, and revising. The neat, clean typed text made many students feel that they were good writers. "The powerful editing tools of the word processor enabled students to explore and experiment with the spelling of words, the arrangement of words or sentences within a story. Language learning seemed to evolve naturally through delighted experiences of discovery."(Moore)

Crozier (1986) states that a child who has trouble spelling will cover up what he knows is bad spelling by sloppy handwriting or, if he is given enough negative reinforcement, write less. By using a word processor the writer is forced to be objective, there is more chance to recognize a mistake and even if wrong can continually change the text without leaving marks of correction to ruin the presentation. The use of spell checkers give the writer the final decision as to the correctness of the spelling of a word. At the very least, Marcus (1990) states, spell checkers aid good writer who are bad spellers.

Getting responses from other readers is an important part of the composing process. The upright monitor and clear print make a student's writing accessible to peers and teacher and can promote social interaction around writing tasks. (MacArthur 1988) Computers contribute to the ease of peer collaboration as shown in a study done by Ruth Kurth and Lila Kurth. The subjects of the study were 46 kindergarten and first grade elementary students in a three week summer enrichment program for teaching writing and other fin arts. Each group was taught basic writing process skills, one with the word processor, one with word processor with voice synthesizer, and one with no word processor. Students using word processing were taught keyboarding and simple word processing commands. Each student was asked to write six stories, and collaboration was encouraged. Children using pencil and paper wrote significantly shorter compositions than either word processing group, but those with voice synthesizers wrote significantly shorter compositions than word processor only groups. Holistic scoring showed no significant difference in quality of written products: all scores were high. Collaboration did occur more frequently in the word processor groups, especially with the synthesizer.

Word processing does not make the process of writing any easier, but it does break it up into manageable chunks which permits skills to develop in an integrated manner rather than in isolation. (Crozier 1986) Traditional methods of teaching writing tend to focus on the end product or completed text, rather than the process through which it is created. With word processing, however, students never have to recopy an entire draft. This means teachers can set higher standards and they can respond to the development and presentation of students of students' ideas. Word processing can facilitate your teaching not only the mechanics of writing, but also the process as a whole (Wheeler 1985). Marcus (1990) states that computers are now regularly seen as a significant means for acquiring language arts skills, for developing students abilities to express what they know and feel. Word

processing technology according to Moore (1989) appears to be an efficient way to address the needs of a language learning curriculum. In particular, the word processor and its powerful editing tool may provide a natural way for students to explore oral and written language in an environment which does not separate reading, writing, language, and real life experiences. (Moore, 1989:609)

A project to increase readability grade levels in tenth graders using computers was undertaken by Sally Hague and George Mason in a middle sized suburban high school. The project also had a hidden agenda, to make reluctant revisers take a second look at their writing. Could student be lured into revision activities under the pretense of trying to raise the readability levels of their compositions. The students were taught the mechanics of the fry readability and given a survey about attitudes toward writing at the first session. Students were taught to use the computer program to calculated the readability of their stories. The students learned to enter their writing samples, edit it for spelling errors and print out the results. Each student wrote a draft copy, inserted it onto the computer, checked the readability of the composition, revised it and determined the readability grade level of the revised paper. Each student saw an increase in the readability grade level from the original draft to the revision. Two students raised their readability by two grade levels; 5 students raised it by three levels; 3 raise it by five levels; and 1 raised it by eight levels. The use of a readability measure and writing with the aid of a computer can indeed cause students not only to take a second look at their writing but also to revise their work.

Four sixth grade classes were the focus of research on the effect of computer assisted instruction on student revision of writing assignment. Two classes were heterogeneous with one using CAI: two classes were in a gifted program with one using CAI. Each class received process approach writing instruction by a teacher trained in the National Writing Project. All student were asked to revise a prewritten story containing "target flaws". Intensive case studies using "stimulated recall" were done with 8 students' revising strategies. While the increased length and higher holistic scores of computer student's papers were statistically significant. The most significant finding was the relationship on the focus of instruction in each class with the type of revision coded: fluency, word choice, and mechanics. The study suggests that revision is driven by instructional emphasis, not computer interaction.

The results of a study done by Emily T. Schanck had quite different result from those of the previous studies. The subjects of the study were twenty two students from one fourth grade classroom. The students were randomly assigned to the experimental and control groups. The experimental group did all creative writing on the word processor and the control group used pencil and paper. The study concluded that there was no significant difference in the number of revision done by fourth grade student regardless of the tool they used.

Wheeler(1985) states that many teachers report that students have an improved attitude toward writing even when they're not using the computer. Word processors can help students improve their writing at least as low as the fourth grade. Attitudes towards writing improve with the use of computers. Taggart (1994) states that her students write longer papers, spend more time revising them and turn in better work. She also found they enjoy using high-tech devices, work independently and enthusiastically to complete assignments and take pride in their creations. According to Moore (1989) using computers appeared to alleviate students concerns about messy papers or poor handwriting. One student stated, "I like the word processor because you don't make many mistakes and when you erase you can't mess up your paper." Others reported, "using the computer I can read what

I type better than what I write." Word processors give students the power to produce neat, printed work, and to correct errors without damaging the appearance of the paper. (MacArthur 1988) He feels this aspect of word processing may be especially motivating for those exceptional students whose written work is typically characterized by poor handwriting and numerous mechanical errors.

In contrast, a study was undertaken by the Educational Testing Service, to determine the effects on essay scores of handwritten and word-processed versions of students essays. Nearly 500 students produced at least two essays, one in handwritten form and the other one on the computer. The essays was then scored. The essays were then transcribed, the hand written essays typed on a word processor and the word processed essays hand written. These same essays were then rescored by trained readers who had not been involved in the initial scoring of the essays. When original hand written essays were word processed and rescored the average score decreased significantly. When original computer produced essays were handwritten and rescored the score increased slightly In analyzing the discrepancies of the converted essay scores the researchers made these observations. 1. The word processed version appeared to be considerably shorter than the corresponding handwritten versions, even though they contained the exactly same number of words. The single spacing of the printouts highlighted this feature. 2. Poor handwriting hides a multitude of sins. In the word processed essays grammatical mistakes and inappropriate paragraphing tend to be more apparent. 3. It was evident from the strikeouts on the handwritten essays that the students made serious efforts to revise their essays. This was not visible on the word process versions of the essays. There is a possibility that the readers may have rewarded the effort that was implied by the revisions in the handwritten essays. This is plausible because the readers, being teachers of writing are often trained to encourage students to revise their work.

Training has an impact on essay scoring therefore, a second study was undertaken. The readers were trained and the first study was repeated. The readers received modified training in the following 1. The results of the first study were discussed and the readers were encouraged to get beyond the different impressions made by the presentation of the essays. 2. The influence of the perceived length on the essay scoring. 3. Using both handwritten and word processed essays in training. 4. Checking for differences in the standards applied to scoring essay in the two modes. The discrepancy favoring handwritten essays was greater in the first study for essays that were originally handwritten and then converted to word processed versions than for word processed essays that were converted to a handwritten format. The transcribers produced neater and more legible versions than that of the original handwritten essay. There were probably fewer instances of unreadable words among the transcribed handwritten essays than among the original handwritten essays therefore less opportunity to give writers the benefit of the doubt. This pattern was not detected in the second study but may have resulted from the standards of the readers.

Researchers have not been able to document support for the strong feeling of improved writing ability that often accompanies students positive attitudes. Lack of evidence regarding improved writing ability may be attributed to the fact that most research has been done over a short period of time, which may not be long enough to show measurable differences of growth in writing ability: writing proficiency may not be influenced by the tools used to write: appropriate teaching strategies have not been developed in using word processors to teach writing.

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Too Early to Judge the Impact?: Computer-Assisted Writing Instruction

ERIC Digest Number 2.

by Bruce Tone; Dorothy Winchester
ERIC Clearinghouse on Reading and Communication Skills, Bloomington, IN.

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Anyone who has learned a word-processing program and uses it regularly on a computer at work or home might be disappointed with reports to date on the impact of the computer on student writing. Features of word processing which allow a writer to revise quickly produced hard-copy drafts should, it seems, effectively serve writing instruction; but until the time students have enough access to computer work-stations to practice and become comfortable with word processing while they are learning to process written language, it is probably too early to judge how effective the computer will become in improving student writing.

Computers are becoming more common in schools. In 1983, Withey predicted that the computer "may have a firmer hold on the future than do English teachers." That same year, a survey (Ingersoll, Elliott,and Smith, 1983) estimated that there were over 200,000 microcomputers in U.S. elementary and secondary schools; and it predicted a 60-percent annual growth rate for the following years. That would suggest that well over two million computers are now accessible to elementary and secondary students and teachers; and in the light of initiatives launched by Federal agencies and some states to develop computer-assisted instruction, that figure may be conservative.

A search of documents entered in the ERIC database between 1983 and 1987 identified over 50 reports on computer-assisted writing instruction; but a review of these documents suggests that the influx of computers into schools does not assure students regular and sufficient time to learn to write on them. It appears that in most schools, computers reside in a computer laboratory shared by all the teachers and students in the school. Students participating in special writing programs usually must leave their more familiar classroom environments and go to the computer laboratory.

HOW MUCH TIME ON TASK?

The presence of computers in regular classrooms may not guarantee that students will have ample opportunity to use them. A Canadian study of 90 teachers and 180 elementary students in three grades (Larter et al., 1987) placed computers in regular classrooms. Each teacher worked with one student learning to write on the computer and with one writing in longhand. This report, which is replete with data on various time-on-task analyses, does not clarify how the teachers scheduled the experiment while teaching their classes. Each experimental subject, nonetheless, had access to the computer in his or her regular classroom; and the average time spent writing on it over a six-month period was an hour a week. Students who logged the most hours on a computer averaged about 60 hours over six months.

Several of the reports in the database indicate that many students learning to write with computers are lucky to get 30 minutes experience a week. Whether the atypically larger amount of time and experience the students in the Canadian study had with the computers was sufficient to allow them to become very proficient word processors is not clear.

WHY DON'T COMPUTERS ENCOURAGE REVISION?

Limited time-on-task may explain why so many of the reports in the database fail to mention the benefits of computer-assisted instruction in encouraging revisions and why several reports specify that the students did not get opportunities to print and see their efforts in hard copy. Such applications provide no opportunity to evaluate the feature of computer writing that recommends itself to many practiced writers: the almost immediate opportunity to see and react to what one has written and then to make changes which can be quickly reprinted.

Yet the studies which have focused particularly on revision do not support the notion that writing on computers should encourage a student to revise. Daiute (1985) found no difference either in quality or quantity of revision for junior high students writing with and without computers. In another study, Daiute (1986) found that students writing on computers revised less than those using pens and pencils. The computer writers, however, got higher scores on their finished products after getting lower scores on their first drafts, suggesting that computers may have led to more effective revision.

Nor did the college students in Hawisher's study (1987) revise more than those not using computers; but, interestingly, this study found no positive relationship between revisions and quality of writing. For younger children, there are several simplified word-processing programs available, but even with these, it appears that students who are being taught to write on computers do not get enough time-on-task to become comfortable with simple word-processing features like "insert" and "delete" or to use them freely in making revisions--let alone enough time to learn to "block" text, move it for reorganization, and then print and analyze the results for subsequent revision. A recent guide from Phi Delta Kappa (Schaeffer, 1987) outlines the teaching of writing with the microcomputer as a seven-year procedure. Although students in classes following this process are learning simple revision commands in the second grade, the program sensibly reflects the fact that it takes a reasonable amount of time for students to learn word processing.

ARE THERE BENEFITS?

Most of the reports in the database have, nonetheless, found that computer-assisted writing instruction has some effect--if not dramatic impact--on both the quantity and quality of writing (e.g., Stine, 1987). Most of these evaluations rely on informal teacher observation and product review; but the frequency of cautious endorsement of computer-assisted instruction across many of these reports suggests that differences reported are reliable. Some of the relatively rare experimental studies in the database have reported similar results.

However, a report by Dean (1986) questions the potential for computer-assisted writing instruction. Dean found that on a college entrance exam, college freshmen who were not trained to write using word processing outperformed those who were trained to write on computers. Dean expressed concern about the cost of the computer-assisted writing program and the extra instructional time it required. Hass (1987), on the other hand, found that experienced writers who wrote letters with pen and pencil took longer to complete the task than subjects who followed the guidance given by a computer program and that the letters of the latter group were better.

There are other exceptions to Hawisher's indication that computers did not encourage critical reaction to what was being composed, and they are reported in studies which involved some form of team or peer editing and reaction. Dickinson (1986) found that when collaborating on a writing project at a computer, first-grade children developed language skills while planning and evaluating their project. Heap (1986) reported on a program that teamed a writer with a peer as "writing helper"--a kind of in-process editor--and another

classmate as a "technical helper" to advise and discuss solutions to word-processing problems. Piper (1987), Smutek (1986), and Heap each found the computer effective in assisting teamed writing instructionfor students learning English as a second language.

IS WORD PROCESSING THE ONLY APPROACH?

Also in the database are reports on the use of computer software which assumes a strong instructional and interactive tutorial role. Most of these programs guide the student writer through the identification of topic, the brainstorming and then organizing of jot notes on the topic, and the application of the resulting outline to produce a written document (e.g., Huntley, 1986). Strickland (1987) conducted a case study using such a program and found it effective. Styne (1986) reported on how a computer program that guides students as they compose poetry generated enthusiasm among college freshmen.

Some teachers of writing at higher levels involve students in the development of their own software programs to guide their writing. Walton and Balestri (1987) discuss studies that link instruction in computer programming and college freshmen composition which they feel help students understand writing as a design discipline. Bruce (1987) cites such approaches as the precursors of the computer's potential in facilitating thinking, creativity, and language development.

In addition to computer software which guides a writer through the formation of his or her own ideas, there are, of course, programs of preformatted exercises that many teachers consider important to writing instruction. Smith (1986) discussed "a plethora of skills and drills software" that often lacks quality because it is not theoretically based. Such programs present, in effect, a kind of electronic workbook, which may have the potential to hold student interest through programmed practice but which may not relate to the process of writing.

WHEN CAN WE KNOW?

The computer's great promise to writers who know how to compose on one is its facilitation of revision. As Withey described it, the computer can be "a blank page on which the student can write, revise, and edit...." What the writer who uses a particular word-processing program needs to keep in mind, however, is how long it took him or her to become comfortable with the new tool. What kind of familiarity with both the keyboard and the written word did the writer have before sitting down to learn word processing? How many hours of writing in front of a computer monitor did it take before the writer learned how to use the features o the program comfortably? When did focus on the ccmputer software stop competing with getting the best words in the most effective order? After how many hours did word processing first begin to serve effective composition?

The ratio of computer stations to students may have to provide more time-on-task before we can adequately evaluate the computer as a tool for writing instruction. That kind of access, it seems reasonable to point out, is going to involve considerable investment in expensive hardware that has an annoying way of becoming obsolete; it also means that teachers interested in using the technology need to be trained to use it productively. With those factors in place, writing instruction will--as has always been the case--rely on the enthusiasm, abilities, and effective methodologies of good teachers.

The teachers and other researchers who are now experimenting with computer-assisted instruction are building an important database that will be analyzed for guidance in developing effective methodologies. The computer is a technology that will almost certainly become more and more accessible in the lives of students, including the young writers

involved in the studies reported to date. Many of these students will be writing regularly using computers. Whatever the limits of the experience they got using computers, it can become a valuable one.

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ERIC Digest

Early Childhood Classrooms and Computers: Programs with Promise

James L. Hoot and Michele Kimler

This digest discusses two promising computer programs for early childhood classrooms. These programs—word processing and Logo—are beginning to show benefits as learning tools. The role of the teacher as an essential element in the success of these programs is also explored.

During the 1980s, computers achieved widespread use in classrooms for young children. As we approach the 1990s, teachers are coming to realize that the mere presence of these computers does not assure student learning. Unsupported claims of early computer zealots are now giving way to a developing body of research which can assist early childhood educators in making justifiable use of these technological tools in early childhood curricula. The digest which follows discusses two uses of computers that, based upon recent research, appear especially productive as learning tools in classrooms—word processing and Logo programming.

Word Processing

Those who work with very young children are aware that children are generally quite effective in making themselves understood. Their language is very much alive, fresh, creative, and often unpredictable. While children's verbal language possesses tremendous potential for communicative competence, because of their lack of motor facility they have less potential for achieving equal competence in written communication.

Over the past five years, word processors specifically designed for children who are just beginning to use print have been developed. Experts are finding that these programs can support beginning writers in many ways; for example, word processing:

- —Provides visual, motor, and sometimes auditory, supports for unsophisticated learners.
- —Often encourages learners to write more since the mechanical drudgery traditionally associated with writing is minimized.
- —Encourages writers to focus on the content of what is said rather than the form or technical aspects of writing.
- —Increases the likelihood that children will revise text—a key process in effective writing.
- —Provides products that are printed with a letter-quality appearance that encourages children to share written communication (e.g. stories for the library, signs, banners, books).
- —Involves writing on a computer screen which is visible to passerbys. This public nature of word processing encourages social interaction in writing.
- —Makes writing especially appealing to limited English proficient and special needs children.
- —Encourages positive attitudes toward learning in many curricular areas.

Recent and Near-Future Developments

Over the past couple of years, word processors which "speak" text created by children have become available. Initial research suggests these devices are highly motivational and promote improved understanding of the relationships of letter and sound, and of word and sentence. In addition to "talking" word processors, programs are under development and will soon be available which create written text directly from spoken words. Thus, the richness of children's language may be captured without the necessity of typing text.

Logo and the Classroom

Logo is a highly sophisticated graphics-oriented programming language developed specifically for children. Logo, which was introduced into classrooms about seven years ago, is specially designed to enable children to become active participants in learning. To date, researchers believe that:

- —Logo programming develops problem-solving abilities. More specifically, such programming

develops procedural problem-solving skills in which larger problems are broken down into smaller, more manageable chunks.

- —Logo facilitates assimilation of basic geometric and mathematical concepts. Some researchers have even indicated success in using Logo to introduce concepts often considered too difficult for primary children.
- —Children collaborate more when working on computer problems than when working on other classroom tasks.
- —Learning how to plan well is not intrinsically guaranteed by the Logo programming environment, and such learning must be supported by teachers who know how to foster the development of planning skills.
- —Logo may enhance social development of children. The Logo environment may encourage children to learn to cooperate, listen, and be critical in a constructive fashion, and to appreciate the work of others.
- —Children who are working with Logo, engage in more self-directed explorations, exhibit more pleasure at discovery, use verbal and other types of problem solving strategies more often, and make greater improvement in attitudes to learning than do children who do not use Logo.
- —Logo provides an environment which encourages divergent thinking and creativity.
- —Students using Logo tend to improve in overall cognitive, social, and behavior skills.
- —Logo promotes development of the ability to describe directions (spatial relation development).
- —Logo is especially effective in motivating children with special needs.

Word Processing, Logo, and Classroom Teachers

Current literature tends to demonstrate consistency concerning the importance of the classroom teacher. The teacher has been found to be the single most influential determinant of success in creating problem-solvers through the use of Logo or improving the written communicative competence of children with word processing. Effective teachers have an understanding of both the power and limitations of these programs for children. Moreover, these teachers are well-grounded in knowledge of the cognitive processes being developed and of child development.

Conclusion

In the next decade, the use of computers as a learning tool will become even more prevalent. It will be necessary, therefore, for educators to become increasingly aware of what computers can and cannot do for the educational development of children. In this digest we have summarized developing research which, though it is far from definitive, is beginning to confirm the merits of using word processing and Logo in the early childhood curriculum.

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The Impact of Computers on the Writing Process

CHARLES A. MACARTHUR

ABSTRACT: Computers are powerful and flexible writing tools that can have a significant impact on the writing process and on the social context for writing in the schools. This article examines the key features of word processing, reviews the research on word processing, and discusses other computer applications that can support writing instruction.

■ The computer is not a magical writing tool that will transform the way in which exceptional students write; neither is it a writing curriculum or an instructional method. However, it is a powerful and flexible writing tool with certain physical characteristics and information-processing capabilities that may affect the writing process and facilitate certain types of writing instruction. Computers can support the cognitive processes involved in planning, writing, and revising text. Equally important is the potential impact of the computer on the social context for writing in the classroom.

This article first discusses the key features of word processors and how they may affect the writing process and social context for writing. Next, a summary is presented of research evidence on the overall impact of word processors in schools. Finally, the article discusses the potential role in instruction of several extensions to word processors, such as spelling and style checkers, synthesized speech output, computer networks, and prompting programs that support planning and revising.

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FEATURES OF WORD PROCESSING AND THEIR EFFECTS

Word processing differs from handwriting in several important ways that may influence the writing process. First, word processors permit flexible editing of text. Second, the visibility of the monitor and the use of a keyboard make writing more public. Third, they provide neat, printed copy. Fourth, they change the physical process of producing text, replacing handwriting with typing. Finally, word processors are complex tools that require some learning. The significance of each of these features is discussed in turn.

Flexible Editing

The most often mentioned characteristic of word processors, or text editors, is the flexibility they provide in revising text. Changes in spelling, insertion and deletion of words and sentences, and large-scale movement of blocks of text can all be accomplished relatively easily. The potential impact of word processors on revision is significant, since revision has been identified as both an important part of the composing process and a factor that distinguishes expert from novice writers. Though expert writers revise frequently to clarify meaning as well as to correct errors, the revisions of inexperienced writers are limited primarily to surface changes (Scardamalia & Bereiter, 1986). The ease of revision on the computer may encourage writers to make more revisions and improve their texts. It has also been suggested that the editing capability can affect the entire composing process by encouraging authors to write freely without concern for errors and awkward spots because it is so easy to make changes later (Daiute, 1985).

Some cautions are in order, however. The research evidence to date indicates that the impact of word processing on revision depends on individual writing skill. Revision is a complex cognitive process requiring writers to evaluate their writing, diagnose any problems, and figure out what changes to make (Flower, Hayes, Carey, Schriver, & Stratman, 1986). If students do not possess these cognitive skills, easing the physical requirements of revision will not help. Thus, it is not surprising that initial research indicates that experienced adult writers revise more extensively when using a word processor (Bridwell, Nancarrow, & Ross, 1984), but that word processing has limited impact on revision by inexperienced writers (Daiute, 1986; MacArthur & Graham, 1987).

Daiute (1986) reported that average eighth-grade students corrected more mechanical errors with a word processor than with pen and paper, but made few substantive changes within the text. MacArthur and Graham (in press), in a study of learning disabled (LD) students' composing, found no differences between handwriting and word processing in the overall number of revisions made by students, in the syntactic level of the revisions, or in the proportion of revisions that affected the meaning of the text. In both conditions, the majority of revisions were surface changes or minor changes in wording that did not affect meaning. The timing of revision, however, did differ between methods. With word processing, students made most of their revisions as they wrote the initial draft; whereas with handwriting, most revisions occurred when recopying the story. This difference suggests that, rather than freeing students from mechanical concerns during writing, the ease of editing may encourage writers to make many minor changes during initial composition.

Although word processing by itself appears to have little impact on revision by exceptional students, it may facilitate learning revising skills in an instructional context that teaches those skills. Graham and MacArthur (1987) taught LD students a strategy to use when revising opinion essays at a word processor. The strategy instruction increased both the overall number of revisions and the proportion of revisions that affected meaning, and also resulted in essays that were longer and higher in overall quality. Morocco and Neuman (1986) reported that a process approach to writing instruction combined with a word processor helped LD students learn to revise.

Visibility and Social Context

A second characteristic of word processors, less noted but perhaps equally important in instructional settings, is that the upright monitor and clear print make a student's writing accessible to peers and teacher and can promote social interaction around writing tasks. The accessibility of the monitor and the keyboard can be used to facilitate collaborative writing activities among students and sharing of work in progress (Levin, Riel, Rowe, & Boruta, 1985). Discussion of work with peers is a well-established principle of effective writing instruction (Graves, 1983). It should be noted that instruction on working cooperatively with peers is needed to ensure that collaborative writing activities are productive.

The visibility of writing on a word processor can also facilitate interaction between students and teachers (Morocco & Neuman, 1986). Teachers can observe the writing process of their students and gain a better understanding of how individual students approach writing tasks. Teachers can intervene at appropriate points to provide help with difficulties, to reinforce student decisions, or to react as a reader. Of course, the timing and content of teacher comments and questions are critical. Morocco and Neuman reported that special education teachers tended to intervene more actively when students wrote at a word processor, but that the impact on students depended on the teacher's approach to writing instruction. They found that students' motivation and sense of ownership of their writing were enhanced when teachers provided procedural support, or help in how to approach writing tasks, rather than giving substantive help with content or focusing prematurely on mechanics.

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/ord processors give students the power to roduce neat, printed work and to correct errors ithout damaging the appearance of the paper. his aspect of word processing may be espeally motivating for those exceptional students hose written work is typically characterized y poor handwriting and numerous mechanical rrors.

Printed output may also encourage publicaon of work in a variety of formats for real udiences (MacArthur & Graham, 1987). Word rocessors and related software make it possible produce letters, books, newsletters, and other ublications with a professional look. Such ublishing opportunities are valuable in estabshing writing as a meaningful act of commuication and in motivating student writing Graves, 1983). When the teacher is the only udience, children may see writing as an xercise in correct form and display of knowldge—and as another opportunity for failure. /hen writing for a real audience, they start to ee writing as a meaningful way of telling others bout their experience and knowledge. Publicaon can also make all phases of the writing rocess more meaningful. For example, publishg a newspaper involves students in gathering nd organizing information, selecting the most nportant points, writing clear descriptions, and evising and editing each others' work (Riel, 985).

yping

yping is potentially an efficient way of producg text, especially for students with poor andwriting skills. Typing is not typically part f the elementary school curriculum, however, nd most students find that typing is slower and equires more attention than handwriting. When yping is not automatic, it may interfere with gher order processes involved in composing nd adversely affect students' writing. MacArhur and Graham (1987) found that typing roficiency was highly correlated with the length nd quality of stories composed on a word rocessor. Our observations and those of others Daiute, 1985) indicate that the slowness of yping can be frustrating for students and nterfere with motivation.

Students need systematic typing instruction if they are to use word processors regularly. A reasonable goal, short of touch typing, is for students to use the correct fingering while looking at the keyboard and to achieve a rate at least equal to their handwriting. Brief instructional sessions can be included as a regular part of computer use. Several typing tutorials are available that provide carefully sequenced instruction, practice on phrases and sentences, and feedback on rate and errors. Teachers should monitor students to encourage them to use the correct fingering. Programs that emphasize games with time pressure should probably be avoided since they encourage students to abandon correct form for short term increases in speed.

Operation of a Word Processor

In addition to typing, students need to master the text-editing, filing, and printing operations of the word processor. The design of word processing software has improved in recent years both in power and in ease of use, and several word processors have been designed specifically for use by younger students. Nonetheless, beginners of all ages commonly experience some frustrating difficulties in learning to use a word processor. MacArthur and Shneiderman (1986) described some of the problems that LD students have in mastering a word processor. One persistent problem area is misunderstanding the function of the return key in formatting text on the screen, which causes problems when students revise and print their work. Another common problem is loss of written work due to confusion about procedures for saving and loading files. Difficulties can be reduced by careful design of word processing software, selection of appropriate software for varying ages of students, and instruction in the operation of the word processor that anticipates common areas of difficulty (MacArthur & Shneiderman, 1986).

OVERALL IMPACT OF WORD PROCESSING

Motivation to write is often mentioned by teachers as a central reason for using word processors, and there seems little reason to doubt the numerous reports that word processing increases motivation (Daiute, 1986). In addition to improving motivation, two studies with LD students (Kerchner & Kistinger, 1984; Sitko & Crealock, 1986) reported that the use of word processing resulted in increases in the quantity and quality of student writing. Neither of these studies, however, compared the effects of special instruction in writing combined with a computer to special instruction without the computer, thus making it impossible to determine the contribution of the computer.

Research that has examined the effect of word processing independent of instruction has reported little impact on students' written products. MacArthur and Graham (1987) had fifth- and sixth-grade LD students, selected for their experience with word processors, write and revise stories using handwriting, word processing, and dictation. The handwritten and word processed stories did not differ on any of the product measures, including length, quality, story structure, and mechnical errors. Daiute (1986), in a study of nonhandicapped junior high students with extensive word-processing experience, found that the final drafts of word-processed compositions were somewhat longer than handwritten compositions and contained fewer mechanical errors but were not significantly different in overall quality.

Qualitative studies of the use of word processing in classroom settings indicate that the impact of computers on writing depends on the social and instructional context. Rubin and Bruce (1985) found that the effectiveness of word processing and related software depended on the decisions that teachers made about how to use the software and the social interactions that teachers permitted. In particular, they reported that the word processor facilitated social interactions among students if the teacher encouraged collaborative work. Morocco and Neuman (1986) found that word processors could be used to support a traditional skill-building approach to writing instruction, as well as an instructional approach focused on writing as a process. In the skill-building approach, word processors were used to present exercises and to correct mechanical errors in compositions. Within a process approach, word processors facilitated teacher-student interaction about the content of student writing and strategies for writing.

Research on word processing in school settings, especially with exceptional students, is still limited. Research is needed that examines the use of word processing with specific instructional techniques, such as instruction in revision, and with specific exceptional populations. Interactions among word processing, instructional methods, and the social context for writing also need further exploration.

BEYOND WORD PROCESSING

The potential of the computer as a writing tool is not limited to word processing. Other computer applications, such as networks, spelling checkers and style analyzers, interactive prompting programs, and synthesized speech may also contribute to writing instruction for exceptional students.

Networks

Networks, both local area networks within a classroom and telecommunications networks, can offer expanded possibilities for written communication with real audiences. Peyton and Batson (1986) described the use of a network within a classroom to teach writing classes for hearing impaired students in which all discussion and interaction were conducted in writing. The network software enabled real-time conversation in writing. For hearing impaired students, the network provided an immersion approach to mastering English. The potential of the approach is not limited to hearing impaired learners. For hearing students, the approach can profoundly change the social context of writing and learning, facilitating collaborative writing and providing a connection between conversation and more formal writing.

Telecommunications networks can support written communication activities with distant audiences. Students need to write first for peers, parents, and teachers that they know in order to get direct feedback on how well their writing communicates (Graves, 1983). Students also need to write for less familiar audiences since a major way in which writing differs from conversation is that the audience is removed in time, space, and context (Scardamalia & Bereiter, 1986). The Computer Chronicles Newswire project (Riel, 1985) initially involved third and fourth graders with learning problems from three classes in Alaska and two classes in southern California and later expanded to include students from many countries. Students wrote articles about events and issues in their school and community and posted them on the net-

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work. Each site published a newspaper that consisted of articles selected from the network by the student editorial board. In the process, students entered into dialogues with others from different cultures, struggled with communicating clearly in writing, and gained valuable experience in evaluating and revising compositions. Cohen and Riel (1986) reported that essays written by seventh-grade students for other students via the newswire project were superior to essays written for the teacher to grade.

Spelling Checkers and Style Analyzers

The analytical power of the computer can be tapped to help students with editing. Spelling checkers will check each word in a document and recommend possible spellings for any word not appearing in the program's dictionary. Sophisticated programs, for example, Writers Workbench (Frase, Kiefer, Smith, & Fox, 1985), have been developed that will analyze aspects of style and grammar and provide editorial suggestions.

Spelling and style checkers have promise for exceptional students who typically have difficulty with spelling and mechanics, but further development of software designed for educational purposes, and of instructional methods, will be needed before computer analysis of writing will be helpful to beginning writers. Students can use spelling checkers to compensate for poor spelling skills, but current software was not designed to help students develop spelling skills. A spelling analysis tool designed for instructional purposes might look for common patterns in misspellings and provide that information to the teacher and student, or it might highlight only misspellings in a small set of words that an individual student is currently working on. Current style analysis programs were developed for business settings and are of limited usefulness for writers below the college level (Bridwell et al., 1984).

Interactive Prompting Programs

Several researchers have tapped the interactive capabilities of the computer to develop prompting programs to guide students in applying effective strategies for planning, writing, and revising. Most of the development work to date has addressed the prewriting stage, focusing on invention and organization. Burns and Culp (1980), for example, tested the effectiveness of a program that carries on a dialogue with college students to help them generate ideas on a topic. The program presents prompts based on rhetorical theory and has some limited capacity to respond to cues in the student's responses. The Quill writing system (Rubin & Bruce, 1985) includes a Planner program that presents a series of questions designed to elicit ideas for an article. The prompts can be modified by the teacher for different types of writing. When used for a news article, for example, it might prompt students with who, what, where, and when questions. The student's responses are printed out for use in writing the news article.

Prompting programs have also been developed for use during composing and revising. Daiute (1986) used a word processor that included a revision prompting program. The program provided a set of questions that writers could ask themselves about the text they had just written, such as "Does this paragraph make a clear point?" Based on the student response, the program offered general suggestions for improvement. Daiute (1986) compared students' writing on the word processor with and without the revision prompts and reported that the prompts led students to make more frequent and meaningful revisions; no data on overall quality were reported. Woodruff, Bereiter, and Scardamalia (1981) developed prompting programs to help students write opinion essays. Although middle school students liked using the programs and thought they were helpful, the programs had no effect on written products.

Scardamalia and Bereiter (1986) describe computer prompting programs as a form of procedural facilitation, aimed at easing the executive burden of writing by providing direct support in some aspect of the writing process.

Prompting programs could also be used within a strategy instruction approach to writing (Graham & Harris, 1987). Direct teacher instruction in a composing strategy could be followed by guided practice with a computer program that prompted students to follow the strategy.

Synthesized Speech Output

The first talking word processors were designed for visually impaired and vocally handicapped users, but recently word processors with synthesized speech output have been developed to support reading and writing activities for beginning readers and novice writers. Speech output permits inexperienced or poor writers to use their relatively stronger auditory language skills to monitor their written production. Rosegrant (1986) studied the use of a talking word processor with first, second, and third graders over a 6-month period. Students used the speech output to monitor the spelling of individual words as they wrote, to catch errors in syntax, and to listen repeatedly to their entire text. In comparison with students who used the word processor without speech, these students spent more time writing, made more revisions, and produced texts that were longer and higher in quality. Rosegrant theorized that hearing their writing helped students to develop a more "critical ear," and thus to revise more effectively.

A talking word processor can support holistic approaches to reading and writing instruction that focus on meaningful communication rather than isolated skills instruction. Holistic methods must deal with the gap between what children want to express and what they have the skills to write and read. In initial language learning (the model for the holistic approach), adults support children in expressing themselves despite limited communication skills, but such individual scaffolding is difficult to provide in a classroom. A talking word processor can serve as a scaffold for both reading and writing, for example, by helping students read language experience stories and the writings of their peers.

CONCLUSIONS

Computers are dynamic tools for writing; they provide a wide range of opportunities for improving writing instruction. Word processors change the physical process of writing by replacing handwriting with typing and by making revision quick and convenient. Word processors and computer networks can change the social context for writing by supporting publishing for a variety of audiences and by facilitating collaborative writing projects and sharing of work in progress. Computers also can enhance instructional interactions between teacher and student by providing the teacher a window onto the writing processes of individual students. Interactive prompting programs can help students learn strategies for planning, writing, and revising. Synthesized speech can support reading and writing activities by exceptional students with limited reading skills. Spelling and style checkers can help students with the mechanical aspects of writing.

A caveat is in order. As with other educational applications of computers, the impact of computers on writing and writing instruction depends on how teachers and students make use of the technology. If computers are to contribute to better writing, they must be integrated with an effective instructional program. Special educators must develop sound instructional methods and computer-assisted composing tools that meet the needs of exceptional children. Further research is needed to determine how computers can be used most effectively to support writing instruction.

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Literacy with the computer

Writing development involves change and revision. Word processing makes it easy for students to adapt and improve text until they are happy with the results.

Kathleen Heffron

The microcomputer can be used to perpetuate the old or to create the new. Used in its capacity as drill and practice, the microcomputer perpetuates the old, but used as a tool in reading and writing, the microcomputer can creatively explore the new. Integrating the machine as a tool into the learning environment gives the microcomputer credibility within the reading and writing atmosphere – the computer becomes an integral part of the literacy process rather than an adjunct or a games component of the program.

Mehan et al. (1984, p. 512) noted the computer's effectiveness when it is integrated with what is happening in the classroom:

> The microcomputer is most effective when it is integrated into the language arts curriculum, not treated as an isolated activity, and when it is viewed as a tool to meet educational goals, not as a teaching machine that dispenses knowledge.

The microcomputer can too often be viewed as an expensive machine which may teach the alphabet by using audio-visual reward systems (*Caterpillar*) or may teach survival during a cross-country trek by means of a game (*Oregon*) or perhaps may whet the participants' competitive skills in an athletic contest (*Decathalon*). Each of these programs and more may be justified in the light of curriculum integration and support. Yet there are programs and computer materials available that are not just adjuncts to existing curricula but are an integral aspect of the learning process. In this article current theories about writing and reading will be discussed. The part that software plays in supporting these theories will be explained.

Writing and computers

Use of the microcomputer as a tool in word processing is gaining credibility and popularity (Dudley-Marling, 1985; Knappe, 1984; Newman, 1984). Word processors are now used in classrooms from grade one (Phenix and Hannan, 1984) to college level (Wood, 1985). They are becoming as integral to the curriculum as textbooks are.

The use of word processing in classrooms ties in well with recent research on writing. Graves (1983) and Smith (1982) regard writing as a process – a developing product subject to ongoing revision. Writing development involves change and experiments, the freedom to play around with language until the print states what the reader wishes to express. A word processor allows this freedom.

> It allows writers to become more willing to take risks, to be tentative about meaning for longer, to consider organization and word choices more freely than ever before. What this means is that children (and adults too) can learn a great deal about language and the writing process each time they engage in writing. (Newman, 1984)

Because of its potential for adapting text, a word processor aids in the students' awareness of their learning processes. The computer helps the writer understand that learning is an active, not a static, process. Because words, phrases, sentences, and paragraphs can easily be changed or moved around, children using a word processing program can experiment with language to express varying shades of meaning. All versions can be printed out for easy editing or saved for future learning and enjoyment. Comparing successive drafts, students can be aware of the changes in their writing. Even with grade one students, "the computer enabled them to take risks because they could always change their minds" (Phenix and Hannan, 1984). Students grow in awareness of their abilities as writers and authors.

Writing with a word processor also allows students to control their learning. They are programming the computer rather than being programmed by it. What appears on the screen or hard copy is what the writer wants to say, and any decision to revise it belongs to the writer. The student controls both the machine and the process (Papert, 1980; Wood, 1985), whereas with drill and practice software the student is a programmed participant.

Word processing in action: An example

In the spring of 1984, multiculturalism was chosen as a theme for language arts activities for our whole school, since 17 cultures were represented in the school population. Integration with other subject areas – social studies, art, music, religion – was natural and meaningful in the theme's context. Writers, artists, poets, dancers, and parents came to the school to share the pride of their ethnic heritage. The students turned to the word processor to help them express their appreciation. The computer was used to keep a record of events and to write notes of thanks to all participants.

During the theme period, each student was encouraged to research and write of his or her family in the past. As these stories were written, the accomplished students of word processing entered them into the computer's memory and onto diskettes. After the stories were edited and compiled, the students produced a 60 page booklet, *Our Family Stories*, which was distributed to each contributor and to other educators. Pride and satisfaction best described the feelings of the fledgling writers about their production.

The multicultural theme was the students' first attempt at integrating their

computer activities with the curriculum. After the students saw how useful the word processor was, they began to generate stories, poems, and plays.

The next year, the grade six and seven classes produced a publication called "Classy Animals." Each student contributed stories of myth, realistic fiction, or changed viewpoint. Most of them keyed in and edited their own stories and helped their classmates to do so. Since illustrations were often added, the word processor's layout mode was accessed often. The grade six and seven authors speak with pride of their accomplishments when they share "Classy Animals."

Reading and computers

The topic of reading and computers is as basic as the letters on a computer keyboard yet as complex as the software available. To use a computer one must be able to read elementary instructions such as "PLEASE PRESS RETURN." For the grade school student, the quantity of software related to reading is vast – extending from computer assisted instruction (CAI), which teaches reading in subskill packages, to interactive computer-based periodicals with magazine-like articles. It is in these two extremes that one notes the varying theories of reading. This variety of approaches is also manifested in the software.

Many software programs developed by MECC (Minnesota Educational Computing Consortium) treat reading as a composition of subskills in a process. *Train* teaches the letters of the alphabet in order. *Hangman* reviews the spelling of words decided by the teachers. *Prefixes* reviews the meanings of various prefixes and suffixes. Although enhanced by graphics, animation, and sound, these software programs are very similar to workbook pages and are often called "electronic workbooks." Most reading software sees reading as a graduated set of skills to be mastered.

In recent years educators regard reading not as a set of skills but as an interactional process between the reader, the text, and the writer. Readers are people who construct meaning from written language. Readers generate meaning by predicting, confirming, and integrating, using their language competencies. The text must be meaningful within the child's realm of learning before reading can take place.

This current theory of reading presents a challenge to all software producers. Balajthy (1985) notes the difficulty of teaching a computer programmed in BASIC to simulate human interaction. The challenge is to develop software using other than the exact match paradigm which is the foundation for the tutorials and drills of today's software. Balajthy points out the market for reading software is improving. He examines *Puzzler*, which uses "nonjudgmental techniques to develop reading ability" and where students need to predict a topic. *Hello* simulates a conversation between the user and the computer psychologist. In *Zork*, the user searches through mazes for hidden treasures and "the very challenge of communicating with the computer is part of the attraction." Balajthy sees the development of artificial intelligence in computer programs to be a great benefit for developing software that will promote today's reading theories.

The integration of reading and writing

Current theory and research in language acquisition views the integration of reading and writing as crucial. Reading and writing should not be taught as discrete units.

> Reading is learned through appropriate oral and written activities; writing is learned by attending to reading as a writer would – composing orally, reading drafts to peers, and engaging in related activities (Wagner, 1985).

Recently, more computer programs are attempting to integrate reading and writing, as companies begin to see the need to have software that is compatible with today's educational theories.

Writing to Read, an IBM-sponsored reading project, purports to teach reading through a multisensory (tactile, visual, and auditory) approach. "As children learn to write words through these sensory experiences, they assemble the words into sentences and stories, which they in turn learn to read" (Rotenberg, 1984). Children not only learn to write and read, but are given tools for writing more creatively and naturally.

Microzine is a magazine on disk with a twist-a-plot, puzzlers, a data base, simulations, and problem solving. Many articles encourage creative writing through simple word processing systems. *Microzine* offers interesting puzzles and stories and teaches about computers at the same time.

Storytree is a writing program that has the built-in capabilities of a word processor. As writers, students learn to plot and plan stories so that they branch and unfold. As readers, they make choices that determine the course of events and the story's conclusion. The end product of *Storytree* will be an adventure that combines the student author's reading and writing skills. The students control their own learning and develop their thinking and judgmental abilities when using this program.

Conclusion

Learning to use the computer does not automatically create authors and readers. In the process of learning, the students advance through various stages:

- Fear – "I'll break the machine!"
- Awe – "Look what it can do!"
- Pleasure – "I can do it!"
- Confidence – "Look at my story. I did it on the computer."
- Complacency – "I know it all."
- Pride – "I can do all my assignments and stories with the word processor."
- Anticipation – "Do you want to read my story?"

Developing through these stages, the students learn to integrate the microcomputer with their language arts program. They learn the computer can be a tool to develop their literacy skills, to foster their creativity, and to control their learning environment. These are most useful learning objectives for any student. The adaptation of software to current research and its integration into reading and writing programs is also a most promising move for future learning.

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USING THE COMPUTER AS WRITING TEACHER: THE HEART OF THE GREAT DEBATES

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The great debate which has been taking place in the world of writing instruction for some time mirrors the emerging debate concerning the implementation of computers in education. In the Great Writing Debate the central issue concerns whether writing can be taught through a mechanics-usage approach -- grammar, punctuation, spelling -- particularly via the manipulation of words and sentences, such as in workbook exercises, or whether writing instruction needs to rely primarily on the creation of written texts by the student, with mechanics and usage a by-product of the process, dealt with in relationship to the student's writing on an ad hoc basis. In the Great Computer Debate a war rages between the adherents of pre-programmed instruction -- computer-assisted (CAI) and computer managed (CMI) of the drill and practice and tutorial sort -- versus those who advocate using the computer in more holistic ways with the student the creator or programmer of the activities.

The Great Writing Debate and the Great Computer Debate share a common philosophical foundation. The traditional grammar approach, like computer drill and practice, supports the underlying notion that isolating activities into classes makes them easier for students to understand, to learn, and to apply to the larger learning tasks. Opposition to these activities, however, suggests that they are mechanical, done rotely by students, and that information using these techniques is either poorly learned, irrelevant to more holistic tasks, not capable of being applied to new situations or that the segmentalization of steps fails to take into account the range of complex skills needed in the larger processes.

Seymour Papert, author of the best selling book, Mindstorms: Children, Computers and Powerful Ideas, sees the division as one between the computer as "teaching instrument" and the computer as "writing instrument" and states that "this difference is not a matter of a small and technical choice between two teaching strategies. It reflects a fundamental difference in educational philosophies." (1)

In looking over the literature on computers and writing, the existence of this dichotomy is striking. Applications and research fall into one or the other category: the computer as a teaching instrument of the basic skills or the computer used in holistic ways as a writing tool.

Basically two kinds of criticism are made of computer-assisted programs. First is criticism that could be leveled at textbooks, namely that the content of the material about the nature of writing and the writing process is of questionable value based on writing research. A corollary to this kind of criticism is that the computer is being used only as an expensive workbook; many programs essentially do nothing that couldn't be done as well on paper.

Second are questions about the pedagogical approaches. They usually rest on the assumption that students who can put in the correct form of a verb, pick out the topic sentence in a paragraph or find the word that is incorrectly capitalized are learning how to write. In fact, while these are all useful editing skills, they do not help students acquire or improve their abilities in topic selection, focus, coherence, cohesion, the elaboration of ideas or any of the many other activities that involve the creation of written text.

The risk that confronts English teachers who turn to the typical CAI programs as a means of teaching writing is the same problem English teachers confront in the workbook orientation to teaching writing: the skills that are usually being taught are not writing but editing skills.

The belief that grammatical form should take precedence over meaning as the preferred way to create effective writing is greatly disputed by many writing theorists. James Collins, in "Speaking, Writing, and Teaching for Meaning," claims that students taught from this premise become effective in "error avoidance" and that their writing is "brief, vacuous and impersonal, polite and innocuous," (2) Anthony Petrosky deals with the issue of grammar in an article, "Grammar Instruction: What We Know." Based on a review of the literature, especially two carefully conducted longitudinal research studies carried out on the value of grammar instruction to writing improvement, he concludes that the study of grammar has no influence on the language growth of typical secondary students and that "there is no empirical evidence for the teaching of grammar for any purpose." (3)

A new model of the writing process has evolved as a result of the work by contemporary writing process theorists and researchers -- Sondra Perl, Donald Murray, Donald Graves, Lucy Calkins, Janet Emig, Linda Flower and John Hayes, among others. They are exposing the fallacy that writing is a linear series of sequential steps proceeding from pre-writing to writing and then to revision. Methodologies and contexts for studies remain diverse and include the case studies of unskilled college writers by Perl, the use of laboratory protocol analysis of writers speaking into tape recorders as they write of Flower and Hayes, and the studies of children in schools by Graves and Calkins. However, they're discovering phenomena, to a great extent interrelated, that create a new and presumably more accurate view of the real nature of writing.

Perl describes it as a recursive, back and forth shuttling process. (4) She talks about it as one of "retrospective" and "projective structuring." (5) Flower and Hayes say,

> the writing process, like any other creative process, is rarely straightforward or direct. A writer's conclusions, his main ideas, even his focus, are often the product of searching, trial and error, and inference. (6)

They also point out the potentially negative influences of the parts-to-whole approach in teaching writing.

> This process could easily be disrupted by focusing on form too early. Thus a product-based plan may thwart the dynamics of the normal generating process

> by placing unnecessarily rigid constraints in the early stages of the writing process. (7)

Ample evidence exists to question approaches to writing whose principal concern lies within subskills -- such as grammar, usage or form -- rather than meaning and which draw their assumptions from the idealized model of the linear conception of the writing process that no longer appears valid. Emig makes a strong case for writing as a "unique mode of learning" and shows it to be organic and functional, a way of making learning connective and selective. (8) One of the dangers of time spent in ineffective ways of teaching writing is noted by Petrosky in his final evaluation of the role of grammar in teaching writing: "The study of grammar, while serving no ascertainable purpose, also exists at the expense of proficiency in reading and writing." (9) There is a fear, as Emig claims, that

> unless the losses to learners of not writing are compellingly described and substantiated by experimental and speculative research, writing itself as a central academic process may not long endure. (10)

Yet there seems reason to be optimistic about the teaching of writing, the role of the computer in that process, and, perhaps, even reason to believe that the current interest in writing and computerized instruction may serve to create a new emphasis and new strategies in that art. Recent approaches in the area of computers and writing have attempted to shift the focus from the computer as a teaching instrument to one where the student takes a more active role and the computer becomes a writing tool.

Word processing is probably the most common way the computer is used holistically as a writing tool. One of the important questions concerning this approach is how the use of computers affects the composing process. Is writing done on computers different from, perhaps superior to, written work done using other tools?

The question is legitimate. The current electronic age has given us a new sensitivity to the differences between the word as sound and as print. (11) According to Walter Ong, the word has been transformed in three stages: oral, script and electronic. (12) Jack Goody and Ian Watt take an in-depth look at the idea that "writing established a different kind of relationship between the word and its referent, a relationship that is more general and more abstract, and less closely connected with the particularities of person, place and time, than obtains in oral communication." (13) Ong also argues that, "more than any other single invention, writing has transformed human consciousness," by establishing "context-free" language as opposed to the embedded nature of oral discourse. If one accepts their argument that the means of production of thought, oral vs. literate, affects the nature of thought produced, then one may conclude that the different means of producing literate thought -- pencil, typewriter, or word processor -- could exert significant influence on the nature and quality of the written product.

If so, how might these differences manifest themselves? Writing done on a computer could affect the number and quality of ideas, the correctness of grammar, usage, and spelling, the choice of vocabulary, the complexity of syntax, style, and many other aspects of

writing. Unfortunately there is as yet very little research evidence to indicate whether or not such effects do take place.

Burns and Culp have experimented in a Freshman English setting with a program that attempts to break away from the drill and practice format and to encourage students in "the process of exploring subject to discover ideas, arguments, or propositions -- those features which one must know in order to write convincingly about a subject." (14) Their conclusions state that their program encouraged both growth in the number and the sophistication of ideas." (15) This research did not involve the writing of compositions, only the generation of ideas on a topic the students had selected for a research paper. It did not evaluate the number and sophistication of ideas actually used by the students in the eventual creation of their papers. No conclusions can be drawn, therefore, as to the effectiveness of the program to generate ideas in the actual composing process.

Two studies done on computer assisted programs to help children handle structural elements of the composing process were carried out by Earl Woodruff, Carl Bereiter, and Marlene Scardamalia. Unfortunately what appear to be faulty assumptions about the composition process and the subjects' lack of experience in typing and word processing resulted in the creation of ineffective programs on the one hand and inconclusive results on the other. The first study concluded that the program was deemed "not to actually have engaged the students in a higher-level consideration of the composition choices" but resulted in students taking a "what next?" approach to their planning. (16) The second study which continually interrupted the students as they composed to ask them response-sensitive questions designed to "foster more carefully considered and more fully developed essays," resulted in work which received lower ratings. (17) Writers in the act of composing are bound to be disturbed, it would seem, by questions, no matter how well intentioned. The encounter with this new strategy, while long enough to show its ineffectiveness, was too short, even if it had been a pedagogically sound one, to show improved written work. The ability to master new strategies may be a much slower process than researchers realize.

Research into the possible effects of word processing on writers and writing is currently being carried out at the University of Minnesota. The project, a three year plan, is looking at the composing process of writers and the pedagogical implementation of word processing in the context of the classroom. Results, however, are not yet available.

Studies on the effects of word processing with computers on children's writing are currently being carried out at Teachers College, Columbia University, by Colette Daiute. Her preliminary evidence suggests that word processing improves the quantity of writing, the number of revisions, and the length of the manuscripts done by children. (18) These findings, while in themselves insufficient evidence to conclude that the computer has affected the quality of the end product, lend support to that possibility. Studies on the composing process, especially revision, highlight the relationship between revision strategies and the quality of writing. It is probably axiomatic that for real revision to take place, a piece of writing must have substance to it, a certain length. It is easier to revise a longer piece; there is more than can be deleted or rearranged.

Ellen Nold, who discusses the importance of the revision process states that "recent research indicates that one of the major differences between skilled adult writers and unskilled adult writers is the way they revise." (19) Citing Nancy Sommer's work on revising, she says that skilled adults revise globally first and then locally. (20) She makes reference to Beach's suggestion that the sophistication of a writer's revising strategies would be a good indication of the developmental level of the writer. (21)

Using the computer to word process, however, is not without its problems. There seem to be frustrations in learning any word processing program. It takes a period of time before the computer becomes for the writer an extension of his or her body in the same way as the pen usually is. It is possible, while one is learning a word processing program, to get snared in the web of its procedures and to lose important ideas and concentration, disturbing the rhythm and flow of the writing at hand.

In addition to mechanical interruptions, there can be logistical ones. If the computer is located in the user room of a school, there are the distractions inherent in the presence of others that may disturb the quiet concentration necessary for many writers. The writer may find he or she needs materials or sources that are not easily transported, such as dictionaries. The user room schedule may be inconvenient or the computers may be occupied when the writer wants to work. The computer may be "down" for repairs or for maintenance.

But most obstacles can be overcome. When the word processing program is mastered, many writers find that computers allow them to catch their idea flow faster and more efficiently than by pen. Once the idea has been captured, one of the great advantages the word processor represents to the writer over the pen is its ability to delete, to insert, and to move small or large chunks of information easily. Revision can be done swiftly. As one professional writer put it, "It takes the pain out of writing." The ease of revision encourages writers to go back over their work again and again, making words more effective, sentences more powerful, paragraphs more unified. One of the many questions that needs to be looked at more carefully is whether revision done on computers remains the same as might be expected from the writer's developmental level or if the process of writing on the computer facilitates the acquisition of more sophisticated techniques. This is important since improved revision strategies should result in improved writing.

The use of text editors to help writers, after they have word processed their writing, to eliminate errors of grammar and spelling, improve word choice and usage, even to point out organizational matters, is a way the computer is being used as an editing tool. One of the most extensive programs of this nature, developed at Bell Laboratories, is called the Writer's Workbench. These programs may be used by the writer to highlight potential problems. Given the highly complex nature of language, the computer will not always be right, however, and the writer makes the decision whether to change a feature or leave it alone. Conclusions to trials conducted by Bell Labs suggest their programs may result in improved writing. "Compared to first drafts, the last drafts of documents had fewer passive sentences, fewer abstract words, and fewer awkward or wordy phrases." (22) However, no control group was used. Without a control group it becomes impossible to know how much of the improvements on the final drafts is attributable to the programs and how much to the

writer's own skill at editing. Most writers' final drafts will be a noticeable improvement over their first, even without a text editor. While these programs appear to be valuable aids to the writer, more research needs to be carried out which shows the exact nature of advantages and disadvantages in using them.

The composing process via computer may also affect a writer's style. Assessing style, "style in the sense of what is distinguished and distinguishing," as William Strunk an E.B. White put it, is difficult.

> Here we leave solid ground. Who can confidently say what ignites a certain combination of words, causing them to explode in the mind?...these are high mysteries....There is no satisfactory explanation of style. (23)

These difficulties of assessment suggest that comparing changes in a writer's style writing on and off the computer may not be made easily with any sense of objectivity. It seems likely such changes as well as other changes in the written product do occur although we may not achieve a good understanding of them for some time to come.

What is the future of the computer in the teaching of writing? In spite of the recent wave of enthusiasm which is greeting the computer in education, there are notes of caution. Alfred Bork states,

> It is not clear that the computer is going to improve education. The computer, like any new technology, has the potential for improving education or weakening education...the computer is a gift of fire. (24)

If we receive the Great Writing Debate and the Great Computer Debate and agree that for teaching writing the computer is best used holistically as a tool rather than as a drill and practice instrument, the debates will still not be ended. The question of how the composing process is affected using the computer is a complex one, not readily answered. Work in the area of computers and writing needs to take into account the ongoing research on the writing process. Both teachers and researchers need to have a solid theoretical foundation on which to build their strategies and approaches for using the computer as a writing tool. Then, tempering our enthusiasm with a touch of caution, we should attempt to discover through research and personal experience the best educational implementations of this exciting new writing tool.

NOTES

[1]Seymour Papert, Mindstorms: Children, Computers and Powerful Ideas (New York: Basic Books, 1980), pp. 30-31.

[2]James Collins, "Speaking, Writing, and Teaching for Meaning," Exploring Speaking-Writing Relationships, ed. Barry M. Kroll and Roberta J. Vann (Urbana, IL: NCTE, 1981), p. 201.

[3]Anthony Petrosky, "Grammar Instruction," English Journal, 66 (December 1977), pp. 86-88.

[4]Sondra Perl, "The Composing Processor of Unskilled College Writers," Research in the Teaching of English, (December 1979), p. 109.

[5]Sondra Perl, "Understanding Composing," College Composition and Communication, (December 1980).

[6]Linda Flower and John Hayes, "Plans that Guide the Composing Process," in Writing: The Nature, Development and Teaching of Written Communication, vol. 2, ed. Carl H. Fredericksen and Joseph F. Dominic (Hillsdale, NJ: Lawrence Erlbaum, 1981), p. 51.

[7]Flower and Hayes, "Plans," p. 51.

[8]Janet Emig, "Writing as a Mode of Learning," College Compositions and Communication, 28 (1977), pp. 122-128.

[9]Petrosky, "Grammar," p. 88.

[10]Emig, "Writing," p. 128.

[11]Walter J. Ong, "Transformations of the Word," in Interfaces of the Word (Ithaca, NY: Cornell University Press, 1977), p. 17.

[12]Ong, "Transformations," p. 17.

[13]Jack Goody and Ian Watt, "The Consequences of Literacy," in Literacy in Traditional Societies, ed. Jack Goody (Cambridge, England: Cambridge Univ. Press, 1968), p. 55.

[14]Hugh L. Burns and Gorge H. Culp, "Stimulating Invention in English Composition Through Computer-Assisted Instruction, Educational Technology, 20, 8, p. 5. ERIC EJ 232 548.

[15]Burns and Culp, "Stimulating Invention," p. 9.

[16]Earl Woodruff, Carl Bereiter and Marlene Scardamalia, "On the Road to Computer Assisted Compositions," Journal of Educational Technology Systems, 10, 2 (1981-82), p. 141.

[17]Woodruff, Bereiter and Scardamalia, p. 142.

[18]Colette Daiute, "Word Processing," Electronic Learning, (March/April 1982), pp. 29-31.

[19]Ellen Nold, "Revising," in Writing, Vol. 2, ed. Carl H. Fredericksen and Joseph F. Dominic (Hillsdale, NJ: Lawrence Erlbaum, 1981), p. 67.

[20]Nold, "Revising," p. 67, citing N. Sommers, "Revision Strategies of Experienced Writers and Student Writers," MLA, December 1978.

[21]Nold, "Revising," p. 67, citing R. Beach, "Self-Evaluation Strategies of Extensive Revisers and Nonrevisers, College Composition and Communication, 27 (1976), 160-164.

[22]Nina H. MacDonald et al., "The Writer's Workbench," TEEE Transactions on Communications, Com. 30, No. 1 (1982), p. 109.

[23]William J. Strunk and E.B. White, The Elements of Style, Third Edition (New York: MacMillan, 1979), p. 66.

[24]Alfred Bork, "Reactions," in Computers in Composition Instruction, ed. Joseph Lawlor (Los Alamitos, CA: SWRL Educational Research and Development, 1982) p. 73.

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A Collaborative Writing Project Using the Worldwide Web

by Allen Sylvester and Christopher Essex

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Allen Sylvester, Education L517 student:

As I began planning for this project, I hoped to integrate the use of computers into a midterm project involving some aspect of writing instruction. From the readings I had done for this class, it seemed that there had been very little work done in the field of computer telecommunications and how it could be used to contribute to reading and writing. I began to ponder how the newest and most innovative aspects of this field could stimulate students' interest, while requiring them to exercise their reading skills at the same time. I decided to focus on a project utilizing the worldwide web, that part of the Internet that delivers text, graphics and other media to a user's computer.

One has only to watch a half-hour of television or to read any popular magazine to notice that the worldwide web has already made its way into mainstream culture. Nearly every business has an *http* address, and nearly every commercial online service (such as America Online, Prodigy and others) has its own version of a web browser for use by its clients. Storylines in the latest movies revolve around the interactions between people on the Internet, and many news items refer to the residents of 'cyberspace' as a growing subculture. In my opinion, the chance to "surf the web" ought to interest even the most computer-illiterate student.

I set out to build a web site that had written communication as its main focus. Before I could proceed, however, I needed to know the age group and interests of the users it might serve. This provided a challenge until I heard of a project being coordinated by the Gifted and Talented Education department at Indiana University. Their project, called "SPRING-2," was an effort to provide technology and innovative educational materials and instruction to rural gifted youth in southern Indiana. As part of their effort, they provided schools with computers and an internet hookup through IDEAnet, Indiana's statewide bulletin board service. I agreed to help them with certain technical problems in exchange for using their students as subjects for my midterm project.

The students in Project SPRING were 7th and 8th graders in two southern Indiana schools. They fit the profile of what is called the "Rural Gifted." Rural Gifted youth are gifted, though they have not had the educational opportunities that their urban and suburban counterparts have had. A Rural Gifted youth might display his or her giftedness through musical or artistic ability, or through mechanical aptitude. The goal of Project SPRING was to provide these students with extra instruction to "bring them up to speed" in relation to other gifted youth. In my mind, these students were perfectly suited to my project.

I set up a website which modelled the old Appalachian tradition of the "Story Tree", where a storyteller begins a story, and allows group members to add to it, until a unique story develops over time. Since the students participating in my experiment are of Appalachian descent, I hoped that they would take to this format easily. The main obstacle I had to overcome was their lack of reading and writing ability, which is due in part to their environment and to the inequalities which exist in their school systems. The students know they do not have good grammar and spelling skills, and as such they were quite timid at first to expose their writing to review by their peers. I received an e-mail message from one student early on, expressing his misgivings about the project. Eventually, though, the students got over their initial fears.

The site operated by having the students read through the initial storyline, which I provided, a paragraph or so that set the stage for a story in a particular genre such as science fiction or mystery, and then they were invited to add their own paragraph to the story. Then the next student would add on to the story and so on. The students would therefore be asked to exercise their reading skills to comprehend the storyline as it developed, as well as analyzing what had last been said, and synthesizing a paragraph which would continue the thread of the story in a fashion which would in some way lend continuity to the story. I also emphasized, in order to provide a sense of safety for these students who, until now, had apparently never had their writing viewed by their peers, that criticism of other people's writings would not be a part of the exercise. They were just to read, and to continue the story on as best they could.

The first few weeks were frustrating. Between mechanical and software problems between the schools and my site, and the extreme reluctance of the students, I felt the project might not get off the ground. The first student who contributed misunderstood the thrust of the project, and ended the story in one paragraph. I was forced to erase his contribution, explain the concept in person, and hope for the best. I was pleasantly surprised to see the number of submissions which began to arrive shortly after my in-person explanation.

Initially, there were to be two schools participating in the story tree. However, one school was forced to drop out due to the lack of time and commitment of the participating teachers. In the other school, there was great support from the Media Specialist, who felt this was an excellent opportunity for the students to express themselves. She related to me that these are students who never find an outlet to express what they feel, yet are extremely curious about the world outside their little town. These students love the computers that SPRING donated, and spend hours browsing the worldwide web. With this sort of support, I was not surprised about the strong responses received.

It is my belief that such story trees could be used to evaluate the necessity of remediation for certain students. A good reading/writing teacher could view the submissions of a student who has real problems with certain grammatical forms, and could provide gentle remediation on those aspects of writing where the student needs help. Similarly, students who seem unable to grasp certain aspects of reading will exhibit this lack of understanding by either refusing to participate, contributing storylines which bear little relationship to the original, or by showing other non-verbal cues which an alert teacher can observe.

As a former student in schools where personal expression was limited to a few term papers and the occasional journal entry, I remember jumping at the chance to participate in a story-telling contest. This was a single-person contest where you were given the first sentence of a story and were expected to finish it. I never felt quite so free to express myself as then, and I hope that this opportunity gave the SPRING students a similar feeling. I also know that in certain situations, open sharing of stories is not easy for this age group, so perhaps an alternative would be to expound upon the idea that a submission can be made anonymously. I remember feeling a secret joy in seeing how my stories would affect other people. Perhaps a teacher who incorporated this idea into a classroom could take some time during the week to read out loud the most recent submissions as a chance to discuss constructively the way the stories might be improved or changed slightly.

My area of concentration is computers and science. Both of these are areas in which writing and reading are often difficult to incorporate. As a computer teacher, I think that this sort of mechanism would provide an excellent opportunity to have students read and write, and even contribute to stories that were being added to by schools across the world. It would be an excellent extension of this activity to have actual well-known authors make occasional contributions, or even have professors at colleges critique the writings online, or via e-mail, so students can learn interactively. As a science teacher, I believe an extension of this same project would provide a forum for discussion of conclusions and data analysis. Students could work on a global problem, such as acid rain, and confer with fellow students at schools across the nation. They could share data, and discuss findings and conclusions, even participate in a form of "chat" through the Internet, and all the while be utilizing their reading and writing skills without consciously knowing it.

It is my belief that if the use of writing and reading is interesting enough to students, they will actively seek out improvement in their writing and reading abilities so that they will be able to participate more effectively. If they enjoy working with the World Wide Web, and understand that to communicate effectively they have to know how to read and write well, then perhaps they will find the intrinsic motivation to learn these skills in the classroom.

Christopher Essex, Distance Education Coordinator:

After discussing the above project with Dr. Carl B. Smith, director of the ERIC Clearinghouse for Reading, English and Communication and Mr. Sylvester's instructor for the course, I decided that "The Global Campfire," as Mr. Sylvester had titled his online project, would be a great addition to ERIC-REC's *Parents and Children Together Online* magazine, of which I was the editor. This web-delivered magazine, an outgrowth of a popular booklet-and-audiocassette series, featured original articles and stories for children and parents. I felt that the interactive nature of this project would make it a perfect addition to the magazine's offerings on the website. I believed that children would enjoy the opportunity to flex their writing muscles via the worldwide web, and the collaborative nature of the activity would make it an educational as well as entertaining experience for them.

Technically, adapting the project was not especially difficult. Mr. Sylvester had already written the basic text that would go on the pages. He had formatted the text in HTML (Hypertext Markup Language) so that it could be delivered via the WWW. This is a simple formatting technique, and can be accomplished by using any one of a number of HTML authoring programs, such as Microsoft's Internet Assistant, an add-on to the popular Word program, Adobe PageMill, or Hot Metal.

The pages also required the use of a forms processing program called Transform, which would take the text typed in by the student through their web browser (Netscape, Mosaic, or Lynx) and send this text, as an email message, to the person administering the web pages (in this case, myself). It would be easy to make the posting of these additions to the stories automatic, but both Mr. Sylvester and I agreed that this was not necessary or even advisable. Given the free and open nature of the Internet, and the fact that these pages were designed to be viewed by children, we decided that having some sort of editorial control over the content of the stories was important.

The pages were then revised for the particular needs of the *Parents and Children Together Online* audience, roughly 3,000 visitors a month, 'spiffed up' with background colors and graphics created using a scanner, and sent up via an FTP (File Transfer Protocol) program to the website. This all may sound complicated, but with some small degree of technical assistance from a website manager or educational technology specialist, any Internet-connected classroom teacher should be able to easily design and manage a similar program.

The revamped version of "The Global Campfire" was an immediate and continuing success. We have received contributions from children all over the USA and all over the world--Australia, South Africa, Ireland, to name a few. The magazine as a whole has been awarded Point Communication's *Best 5% of the Web* award, and shares in the ERIC-REC website's *Magellan 4 Star Award* from McKinley Communications, both of these awards no doubt due in part to the interactive collaborative writing forum.

Our plan is to continue to offer "The Global Campfire" as a free service to our readers, and to add new storylines, and multiple storylines to the mix. One of the advantages of hypertext-based systems like the worldwide web is that the reader can have a unique kind control over the text, one that has only been approached, in the printed format, by some children's choose-your-own-adventure books. The growing number of Hypertext Literature, Hyperfiction, or Tree Fiction (all synonyms) sites on the web are growing, (see *http://www.cl.cam.ac.uk/users/gdr11/tree-fiction.html* for a listing of resources) and this collaborative writing format should be uniquely interesting and rewarding to young writers. Though the current format of "The Global Campfire" stories is strictly linear, we plan to add this dimension in the coming issues.

In the following pages, an example one of the story trees is represented. As you read through it, keep in mind that the writings are, for the most part, unedited, though small spelling and grammar corrections have been made. I have also included an example of the actual screens students see as they use the site.

The ongoing "Global Campfire" can be viewed at the *Parents and Children Together Online* website: *http://www.indiana.edu/~eric_rec/fl/pcto/menu.html*

Welcome to The Global Campfire!

Since the dawn of time, humans have entertained themselves and each other around the tribal campfire by telling and retelling stories. Some of these stories became legends which live on to this day. From here, you are invited to take part in this ritual that is as old as humanity itself.

YOU can be a part of the next generation of story-tellers, and maybe your story will become a legend too!

You are now standing in front of the Global Campfire. Around you are gathered the many peoples of the world. Each is as unique and different as you are, yet all have gathered in this place for the same reason -- to share in the storytelling.

Each person who comes here has the right to try to add their part to the great Stories of Humanity. Every person can read what the those who have gone before them have written. As part of the Global Community, each person is expected to be respectful of every other person. Everyone's part is as important as everyone else's. Take your turn with dignity, knowing that your story is precious to the world.

The tradition is simple:

- **Read one of the stories that interests you.**
- **Add the next part of the story.**
- **Check back later to see if your contribution has been added to the story.**

Due to the number of submissions received, it is not possible for every submission to be added to every story. You will increase your chances of being a contributor by paying attention to what others have written before you, and making a positive addition to the plotline of the story. Reader contributions will be added to the stories as soon as possible, but there may be a delay of several days, especially on the weekends. Keep checking back!

What is your pleasure today?

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- **Read and add onto a story.**
- **Learn about the concept of the Global Campfire**

This story-building project is copyright 1995 by EDINFO Press
Project Developed by Allen Sylvester
Project Coordinated by Christopher Essex
A Special Thanks to the students of Crawford County and Paoli, Indiana,
who have contributed their words to this project.

The Global Campfire: Mystery Story

The House at the End of Fleaker Street

Everyone said that the house at the end of Fleaker Street was haunted, but I had always thought that there were no such things as haunted houses. I decided to find out once and for all what was really going on at the end of Fleaker Street.

My friends and I got a bunch of flashlights, some candles, and our sleeping bags. We were going to spend the night in the old house, and hopefully we'd see what was there. None of us believed in ghosts, so of course we weren't afraid to stay there, but secretly I was afraid.

Submission from Justin
Crawford County

We were camping out at the old house. We did not belive in ghosts, so we thought we had nothing to be afraid of. The house had boards over the windows and doors. We went to the door and pried the board off and opened the old door. It made a loud squeak and it fell of the hinges and we went inside and we heard a loud moaning. My friend said, "Let's put the sleeping bags out." We heard footsteps and a groan and a shadow appeared and it said, "Get out of my house!"

Submission from Naomi
Crawford County

But we decided to stay all night anyway. We heard all kinds of sounds. Then we heard footsteps coming down the stairs.

Submission from Matt
Crawford County

During the next night we heard noises coming from the upstairs so after a while the noises started getting on our nerves so we decided to go up and find out what the noises were. On our way up we heard voices on the

other side of the upstairs so we hurried up the stairs quickly but quietly. Then when we got to the room right next to the one that had the voices we jumped in that room and hurried up and ran behind the bed so if they decided to go downstairs they wouldn't see us if they looked in the room. We sat in there and listened to the voices for about 5 minutes then we started to here something behind us so we started to look behind us and when we got about half way around we heared someone start screaming and when we turned back around we seen one of our parteners was gone so we ran down stairs as quickly and quietly as we could and when we got down there we...

Submission from Kathryn
New Lambton, South Australia

...were shaking. I could hardly speak. One of us eventually said that we should go and look for our friend. "Was he still alive?". "What were we going to say to his parents?" Slowly we crept around the house looking in each room. We entered the attic and then, "AAAAAAAAhhhhhhhh!" There it was! The biggest one we had ever seen.

Submission from Lisa S.
Johannesburg, South Africa

A monster was staring us. Its ugly jelly like eyes quivered as they took in our appearance. After we had regained pur composure we glanced around the room.

Submission from Brian
Dublin, Ireland

What happened was that our friend had dressed up as the monster and was trying to scare us. He thought it was very funny when he took off his costume. We were angry with him, but...

Submission from Tommy Dorchak
4th grade, West End Catholic School - Johnstown, PA

...then we heard footsteps coming from downstairs. Then we saw something green and leafy coming in our room.
"Ahhhhhhhhhh!" we screamed.
"Hi guys, I brought you a tulip to make this room smell like a room."
"Mom, don't scare us like that!".
But before Mom put the flower down, the tulip opened its two lips.

Submission from Daniel Gibbs
Rideau, Richmond, B.C., Canada

Did you know that tulips have large teeth? Well, neither did we. . .until that day. The teeth were huge and sharp. We stood terrified. Mom was the first one to move. She ran screaming from the room. We would have too, but the tulip cut off our escape. The sound of its g. ıding teeth made us shudder.
"It's only ɔ flower, what could it possibly do?" my friend asked, with disbelief.
"You're right!" we echoed, "We have nothing to fear."
We relaxed. And we would have stayed relaxed, except for the fact that the flower started to slither towards us!!!!!

Submission from Abbey
Oxford Road Elementary, New Hartford, N.Y.

As the predator plant slithered closer to us, we almost panicked. Bill screamed. "My pocket knife! I just remembered!"
I screamed, "Quick, cut the roots before it reaches us!"

As Bill ran forward, the plant's vines reached out and wrapped around his legs. "Help!" he screamed. Now I did panic.

Submission from Elizabeth
Winfield, Crown Point

"Ahhhhhhhh!" I tried to run, but I couldn't move. Then my friend cut the vine and we all ran downstairs, grabbing our stuff. We ran out the door. But when we got to the porch, we saw a humongous tree blocking our way.

Add on to the story!

Who are you, storyteller?
Please enter your name and your school and city.
Name:
School and City:

When you are done, use the TAB key to move to the SEND button. If you decide not to SEND what you have typed, use the RESET button to erase it.

Remember to SEND your story contribution before you leave!

Press this button to submit the story: SEND.

To reset the form, press this button: Reset

Go back to the campfire

BIBLIOGRAPHY

Selected Abstracts from the ERIC Educational Resources Database

ERIC Clearinghouse on Reading, English, and Communication
Indiana University
Bloomington, Indiana

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How to Read an ERIC Abstract and Find Related Articles on this Subject

The ERIC educational resource database includes more than 800,000 bibliographic records. Educational resources listed in the ERIC database are of two types: EJ, journal (magazine) articles, which are easily found in most Education libraries, or through interlibrary loan; and ED, documents such as Master's theses, which are available at any library that has an ERIC microfiche collection. ED documents can also be ordered directly from ERIC Document Reproduction Service by using the form at the end of this bibliography section.

You may also wish to perform your own ERIC database search, to retrieve the most current information on your topic. This is easily done at any Education library; it may also be available to you online through your university computing system.

In the following bibliography, we have selected some recent relevant articles that you may wish to read for your further knowledge, or to use in a Distance Education Application/Research Project. ERIC abstracts are easy to read, once you are used to the system, which is detailed below.

Sample ERIC Abstract

Note that this abstract has an EJ accession number, which means that the work abstracted is a journal article.

ERIC Accession Number— identification number sequentially assigned to articles as they are processed

EJ466919 EC606287

Clearinghouse Accession Number

Article Title → **Family-Centered Techniques: Integrating Enablement into the IFSP Process.** Andrews,

Author(s) → Mary A.; Andrews, James R. *Journal of Childhood Communication Disorders*, v15 n1 p41-46 1993 ← **Journal Title**

Reprint Availability → (Reprint: UMI) ← **Volume No., Issue No., Pages Publicaton Date**

Descriptive Note → Note: Theme Issue: Service Delivery to Infants and Toddlers: Current Perspectives

ISSN: 0735-3170 ← **ISSN** (International Standard Serial Number)

Major and Minor Descriptors— subject terms found in the *Thesaurus of ERIC Descriptors* that characterize substantive content. Only the major terms (preceded by an asterisk) are printed in the Subject Index of *Current Index to Journals in Education (CIJE)*

→ Descriptors: Child Rearing; *Communication Disorders; *Early Intervention; *Family Involvement; Individual Development; Objectives; Parenting Skills; Skill Development; *Teamwork; Young Children

Identifiers: *Enabler Model; Family Needs; *Individualized Family Service Plans ← **Major and Minor Identifiers**— terms found in the *Identifier Authority List* that characterize proper names or concepts not yet represented by descriptors. Only the major terms (preceded by an asterisk) are printed in the Subject Index of *Current Index to Journals in Education*

Annotation

This article describes techniques, used in a family-centered early intervention project, that both assist in accomplishing the goals of the Individualized Family Service Plan process and create opportunities for families to display their present competencies and acquire new ones to meet the needs of their children with communication disorders. (Author/JDD)

Annotator's Initials → (Author/JDD)

Note: The format of an ERIC Journal Article resume will vary according to the source from which the database is accessed. The above format is from the printed index, *Current Index to Journals in Education*.

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The Following Abstracts on Computers and Writing are from the ERIC Educational Resources Database

AN: EJ501927
AU: Shade,-Daniel-D.
TI: **Computers and Young Children. Storyboard Software: Flannel Boards in the Computer Age.**
PY: 1995
JN: Day-Care-&-Early-Education; v22 n3 p45-46 Spr 1995
AV: UMI
AB: Describes storyboard software as computer programs with which children can build a story using visuals. Notes the importance of such programs from preliterate or nonreading children. Describes a new storyboard program, "Wiggins in Storyland," and its features. Lists recommended storyboard software programs, with publishers and compatible computers. (BAC)

AN: EJ499763
AU: Bonk,-Curtis-J.; And-Others
TI: **Cooperative Hypermedia: The Marriage of Collaborative Writing and Mediated Environments.**
PY: 1994
JN: Computers-in-the-Schools; v10 n1-2 p79-124 1994
AB: Discusses collaborative writing with hypermedia and multimedia tools as well as the requisite hardware and software support that foster cognitive and social skills. Proposes research on the impact on and possibilities for students and teachers using collaborative writing in hypermedia environments. (102 references) (JKP)

AN: ED382163
AU: Cain,-Lu
TI: **Using Technology To Enhance Student Learning Outcomes.**
PY: 1995
NT: 52 p.; Practicum I Report, Nova Southeastern University.
PR: EDRS Price - MF01/PC03 Plus Postage.
AB: This practicum was designed to increase the use of computer technologies, which would enhance student learning outcomes. The primary goal was to improve the language arts skills of third, fourth, and fifth grade students by using specific software and related activities. A secondary goal was to raise teachers' computer comfort levels and skills. With the help of classroom teachers, software was selected and units of study were incorporated with the selected software. Software training sessions were conducted with teachers prior to using the software with their students. Teachers were also assisted in conducting computer lab sessions in which students published their writing. Positive results were perceived from the 12-week implementation. Teachers gained expertise and confidence in using computers. Students independently chose to access academic software programs, and the number of lesson plans including computer software as an instructional resource rose from less than 3% to more than 24%. Five expected outcomes are listed, all of which were met or exceeded through this practicum. Data is presented in seven tables. (Contains 19 references.) (MAS)

AN: ED381791
AU: Wimberly,-Sabrenai-R.
TI: **Improving Written Expression of Seventh Grade Mildly Intellectually Disabled Students Utilizing a Basal Reading Program, Journal Writing and Computer Applications.**
PY: 1994
NT: 53 p.; Ed.D. Practicum, Nova Southeastern University.
PR: EDRS Price - MF01/PC03 Plus Postage.
AB: A practicum was designed to increase mildly intellectually disabled students' written communication skills by demonstrating functional written expression skills in daily assignments and in social communication. A sequenced reading and language program with the integration of journal writing and computer applications was utilized. Seventh- and eighth-grade students with mild disabilities were provided a structured, language-rich environment in which to communicate. The instructor planned structured activities that involved reading, audiovisuals, current events, and cooperative activities along with a structured, daily writing program. Collaboration was an important aspect in that students were involved in many role playing and verbal rehearsal activities to increase conversation and writing skills. Writing to convey a message was emphasized initially and students were introduced to the function of words in sentences. Progress was monitored using holistic scoring methods. Review of the practicum outcomes revealed 7 out of 10 students were able to demonstrate functional written expression skills in journals and on daily assignments after a competent writer had modeled structure. Students' interaction in cooperative activities provided an excellent platform for writing. Students displayed motivation to communicate. Appropriate use of mechanics was documented along with increases in spelled words, sentence length, and legibility. Reading and language instruction reinforced mechanics rules and built upon them. Increased success is predicted if more time is provided for the program. (Contains a figure and 23 references.) (Author/TB)

AN: ED380802
AU: Jackiewicz,-Geraldine
TI: **The Effect of Computer Based Instruction on Writing at the Elementary Level.**
PY: 1995
NT: 38 p.; M.A. Project, Kean College of New Jersey.
PR: EDRS Price - MF01/PC02 Plus Postage.
AB: A study examined the effect of computer-assisted instruction on fourth graders' writing skills. Two fourth grade classes from one elementary school in New Jersey participated in the study. One

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class (the experimental sample) was taught to use the computer as a writing tool, while the other class (the control sample) used only pencil and paper. Both classes were given a pretest and a posttest. Holistic scoring was used to score the paragraphs. Results indicated a significant improvement in writing skills in the experimental class as compared to that of the control class. (Contains four tables of data and 17 references. Appendixes contain a survey and test scores. (Author/SR)

AN: EJ495132
AU: Reissman,-Rose
TI: Language Arts: Multimedia Memoirs.
PY: 1995
JN: Computing-Teacher; v22 n4 p33-35 Dec-Jan 1994-95
AV: UMI
AB: Description of a writing project for sixth graders includes hearing excerpts read from Brent Staples' memoirs, then creating their own multimedia memoirs drawn from their life experiences. Project topics include observing the decay of a neighborhood or death of a relative or neighbor. A list of 17 memoirs written by ethnic minorities for use with children is appended. (17 references) (KRN)

AN: ED376474
AU: Simic,-Marjorie
TI: Computer Assisted Writing Instruction. ERIC Digest.
CS: ERIC Clearinghouse on Reading, English, and Communication,
Bloomington, IN.
PY: 1994
AV: ERIC Clearinghouse on Reading, English, and Communication, Indiana
University, 2805 E. 10th St., Suite 150, Bloomington, IN 47408-2698.
NT: 4 p.
PR: EDRS Price - MF01/PC01 Plus Postage.
AB: Two factors contributing to the change in writing instruction have been (1) the research investigating the way writing is taught and (2) the computer. Proponents of the various writing models endorse writing as an ongoing, multi-stage process, with equal emphasis given to each of the stages. Educational computing has undergone a change of focus regarding how the microcomputer should be used in language arts, especially in writing. As a tool for practice in writing, the word processor's usefulness is unparalleled. Even a beginner can use the delete, strikeover, and insert functions to make simple changes. Teachers can get around the typical problem of too few computers in the classroom by having children write on paper first. The word processor has helped realize the advantages offered in process writing. Revising, editing, and printing multiple copies becomes easy. For effective use of the word processor, schools must make a commitment to its use, and the classroom teacher must make an even stronger commitment to invest a great deal of time in teaching students how to use it. The ideal situation would be to place the teacher at the front of a computer for whole-class instruction. However, a peer-tutoring system can also work. In any case, the key is as much "hands-on" activity as possible. (RS)

AN: ED376442
AU: Meroney,-Barbara
TI: Improving the Literacy Growth of Second Grade Students through the
Use of Whole Language, Peer Tutoring, Cooperative Learning, and
Computer-Based Instruction.
PY: 1994
NT: 133 p.; Ed.D. Practicum, Nova Southeastern University.
PR: EDRS Price - MF01/PC06 Plus Postage.
AB: A practicum addressed the problem that the traditional Chapter 1 program of a school district had not been effective in promoting literacy growth. The students repeatedly read the same stories with equal lack of success each time. They were not motivated to read or write because the purpose was irrelevant and failure was probable. The strategy used with 22 students in one classroom was to combine research-based whole language approaches with cooperative learning activities, peer tutoring experiences (as tutors and tutees), and computer-based instruction. Learning styles and needs were met while students increased their ability to learn and think critically. Results from the Diagnostic Achievement Battery, reading running records, writing samples, checklists of teacher observations, personal evaluations, and surveys reveal that the students showed notable development in literacy growth. Findings suggest that the planned program of instruction helped the students improve literacy growth with confidence. (Contains 97 references, 7 tables, and 6 figures of data. Appendixes present the writing rubric, checklists and survey instruments, and examples of story mapping and story circle diagrams.) (RS)

AN: EJ490795
AU: Chambless,-Jim-R.; Chambless,-Martha-S.
TI: The Impact of Instructional Technology on Reading/Writing Skills of 2nd Grade Students.
PY: 1994
JN: Reading-Improvement; v31 n3 p151-55 Fall 1994
AV: UMI
AB: Compares effectiveness of computer-based instruction in K-2 to traditional instruction on the reading and writing achievement of second graders. Finds educationally significant effect sizes on comparisons of reading scores and measures of writing in favor of the computer-based instruction group for at-risk students. Suggests that computer-based instruction is a powerful instructional tool for K-2 teachers. (RS)

AN: EJ489943
AU: Moxley,-Roy-A.; And-Others
TI: Computer Writing Development in a Prekindergarten Class of 4 Year Olds.
PY: 1994
JN: Journal-of-Computing-in-Childhood-Education; v5 n2 p211-29 1994
AV: UMI

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AB: Studied four-year olds' writing development over a school year by analyzing their output on a word-processing program. Found a combined increase in productivity, complexity, and accuracy. Results suggest that these increases may be attributable to the word processing program and not solely to novelty, maturation and incidental learning, or teacher effects. (HTH)

AN: EJ482044
AU: Sinatra,-Richard; And-Others
TI: **Using a Computer-Based Semantic Mapping, Reading, and Writing Approach with At-Risk Fourth Graders.**
PY: 1994
JN: Journal-of-Computing-in-Childhood-Education; v5 n1 p93-112 1994
AV: UMI
AB: Investigated the efficacy of a computer program approach to help 260 at-risk fourth graders model, practice, and internalize narrative writing skills. Found that the at-risk students responded positively to the use of technology incorporated with instructional strategies for developing higher order thinking and literacy skills. The teachers also indicated positive attitudes toward the use of computers. (MDM)

AN: EJ478080
AU: Casey,-Jean; Martin,-Lelia
TI: **Literacy Instruction in an Integrated Curriculum.**
PY: 1994
JN: Computing-Teacher; v21 n5 p33-34,36-37 Feb 1994
AV: UMI
AB: Two articles describe the use of computer software to help elementary students develop literacy and writing skills: the first article evaluates "Writing to Read" software, comparing its use in classrooms and in computer labs with traditional instruction; the second article discusses using "Writing to Write" software with third graders. (LRW)

AN: EJ478075
AU: Pohl,-Virginia; Groome,-Dana
TI: **"Happy Hands": Pre-Keyboarding Facility for Emergent Writers.**
PY: 1994
JN: Computing-Teacher; v21 n5 p16-18 Feb 1994
AV: UMI
AB: Describes the use of "Happy Hands" instructional materials and techniques for grades K-3 to develop keyboarding knowledge and skills for computer-assisted instruction. Color coding techniques are explained; the use of dictation is discussed; keyboarding games and software are described; and the development of writing skills through keyboarding is examined. (LRW)
AN: ED373777
AU: Allen,-Gayle; Thompson,-Ann
TI: **Analysis of the Effect of Networking on Computer-Assisted Collaborative Writing in a Fifth Grade Classroom.**
PY: 1994
NT: 16 p.; Paper presented at the Annual Meeting of the American Educational Research Association (New Orleans, LA, April 4-8, 1994).
PR: EDRS Price - MF01/PC01 Plus Postage.
AB: This study examined the effects of a computer-mediated networked learning environment on the writing of fifth grade students who used word processing to write four texts collaboratively during an 8-week period. A telecommunication network was utilized to allow the students in the experimental group to send their work via e-mail to an audience of readers who read and responded to their writing. Findings suggest that when students knew they would be sending their writing to an outside reader and when they received a prompt response, there was a positive effect on the quality of writing. Results also suggest females used the computer technology when the environment was cooperative and they had equal access to the equipment. There is also indication that writing to communicate to an authentic audience outside the classroom may have contributed to the males in the experimental group scoring higher on the writing assignments than the males in the control. (Contains 20 references.) (Author/JLB)

AN: EJ389244
AU: Lake,-Dan
TI: **Two Projects that Worked: Using Telecommunications as a Resource in the Classroom.**
PY: 1989
JN: Computing-Teacher; v16 n4 p17-19 Dec-Jan 1988-89
AV: UMI
AB: Describes projects developed through the Long Distance Learning Network (LDLN) that experimented with using telecommunications in classrooms in the United States and in other countries. A creative writing project involving elementary school students in the United States, Canada, and Australia is described, and a seventh-grade geography project is explained. (LRW)

AN: EJ388499
AU: Herrmann,-Andrea-W.
TI: **Computers and Writing in Gifted Education (ERIC/RCS).**
PY: 1989
JN: Journal-of-Reading; v32 n7 p652-54 Apr 1989
AV: UMI
NT: Special Issue: New Technologies and Reading.
AB: Reports that there are few documents in the ERIC database concerning using computers as writing tools for gifted students and that the thrust of computer education for the gifted is toward developing abstract thinking only. Argues that more research is needed on classrooms for the gifted writer. (RS)

AN: EJ386478
AU: Casella,-Vickie
TI: **It's Never Too Soon to Start Kindergartners Writing with Computers.**
PY: 1988
JN: Instructor; v98 n3 p103 Oct 1988
AB: Muppet Slate, a writing program used on Apple computers, is described, along with its successful

integration into a kindergarten language arts program. Students can write original stories illustrated with a choice of 126 pictures. Utilities enable teachers to customize the program to meet student needs. (IAH)

AN: EJ383083
AU: Selfe,-Cynthia-L.; Wahlstrom,-Billie-J.
TI: Computers and Writing: Casting a Broader Net with Theory and Research.
PY: 1988
JN: Computers-and-the-Humanities; v22 n1 p57-66 1988
AV: UMI
AB: Suggests four overlapping areas of exploration that might help spark "creative re-formations" of the way English teachers think about computers and their relationship to writing: (1) computers and teaching writing, (2) computers and language theory, (3) computers and learning from the past, and (4) computer research in other fields. (GEA)

AN: EJ375263
AU: Henney,-Maribeth
TI: Reading and Writing Interactive Stories.
PY: 1988
JN: Computing-Teacher; v15 n8 p45-47,60 May 1988
AV: UMI
AB: Describes a project designed to teach elementary students to write interactive stories using an authoring system called Story Tree. Benefits of the project are discussed, including the development of oral language, listening, reading, and writing skills; and problems with the authoring system, the writing process, and the curriculum integration are reviewed. (LRW)

AN: EJ372401
AU: Wresch,-William
TI: Six Directions for Computer Analysis of Student Writing.
PY: 1988
JN: Computing-Teacher; v15 n7 p13-16,42 Apr 1988
AB: Discussion of programs for analyzing the writing of students using word processors focuses on six categories of available software that can help to improve students' writing skills: error checkers, reformatters, audience awareness programs (including reader's needs and readability formulas), student conferencing utilities, grading utilities, and automatic graders. (LRW)

AN: EJ368918
AU: MacArthur,-Charles-A.
TI: The Impact of Computers on the Writing Process.
PY: 1988
JN: Exceptional-Children; v54 n6 p536-42 Apr 1988
AV: UMI
NT: Special Issue: Research and Instruction in Written Language.
AB: The paper discusses: features of word processors and their impact on the writing process and the social context for writing; research on word processors in schools and the potential instructional role of extensions to word processors, such as spelling and style checkers, synthesized speech output, computer networks, and interactive prompting programs. (Author/JDD)

AN: EJ367281
AU: Crawford,-Reg
TI: Inside Classrooms: Word Processing and the Fourth Grade Writer.
PY: 1988
JN: Canadian-Journal-of-English-Language-Arts; v11 n1 p42-46 1988
AB: Describes an experiment introducing a word processor as a tool for writing in a fourth-grade classroom. Discusses resulting effects on the writing process, especially, revision and editing and on attitudes toward collaborative efforts. (SD)

AN: ED307616
AU: Herrmann,-Andrea-W.
TI: Teaching Writing with Peer Response Groups. Encouraging Revision. ERIC Digest.
CS: ERIC Clearinghouse on Reading and Communication Skills, Bloomington, IN.
PY: 1989
NT: 5 p.
PR: EDRS Price - MF01/PC01 Plus Postage.
AB: Writing instruction reflects a growing appreciation of the value of talk. By implementing peer writing groups, teachers encourage students to give, seek, and react to oral feedback among themselves as they write, in addition to reacting to the teacher's traditional comments on finished papers. Collaboration in writing groups provides writers with an opportunity to read their drafts aloud and to discuss them face-to-face with a peer audience while the written product is taking shape. Studies of peer reaction show both positive and negative effects on revision. Preliminary evidence suggests that the nature of peer collaboration and feedback in classrooms where computers are used to teach writing differs from that in regular writing classrooms. Under certain conditions, computers as writing tools appear to promote a collaborative environment, both in learning to write and in learning to use the technology. The literature suggests that the effects of peer comments on revision is not a simple cause and effect matter, but rather a complex one, dependent upon the interrelationship of multiple factors within the evolving social environment of particular classrooms and groups of students. (Twenty-eight references are appended.) (MS)

AN: ED307606
AU: Shermis,-Michael
TI: Word Processing and Writing Instruction. Focused Access to Selected Topics (FAST) Bibliography No. 10.
CS: ERIC Clearinghouse on Reading and Communication Skills, Bloomington, IN.
PY: 1989
NT: 6 p.
PR: EDRS Price - MF01/PC01 Plus Postage.
AB: Synthesizing research on writing instruction using word processors, this annotated bibliography contains 28 references of articles and papers in the ERIC database. The first section includes strategies, techniques, exercises, activities, and ideas on how

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to use time on a word processor most effectively. Articles and papers discussing the numerous benefits of word-processor use, including motivating students to spend more time on task and encouraging changes and rewriting, are presented in the section. The resources in the last section will be helpful in selecting word-processing programs and other kinds of instructional software. (MS)

AN: ED301887
AU: Head,-Susan-D.
TI: **The Sweetwater Model for Writing Improvement.**
PY: 1988
NT: 19 p.; Paper presented at the Annual Meeting of the Association for the Development of Computer-Based Instructional Systems (Philadelphia, PA, November 5-7, 1988).
PR: EDRS Price - MF01/PC01 Plus Postage.
AB: This report describes a computer-assisted writing laboratory project integrating Model Curriculum Standards (teacher-developed instructional literature guides integrating the reading of core pieces of literature with the writing process), the writing process, computer hardware and software, and staff development. The report estimates that in the second year of the project (1988-89) 20,000 students at 18 junior and senior high schools in the Sweetwater Union High School District (Chula Vista, California) will rotate through the 36 laboratories and complete a variety of writing assignments allowing them to incorporate revision as a natural part of writing and allowing the 250 teachers to respond more to content and text-level issues. The report also describes the 3-year evaluation plan for the project. Appendixes include a list of 41 literature-based writing assignments, the results of a survey of teachers in the project, and excerpts from student evaluations. (RS)

AN: ED300766
AU: Balajthy,-Ernest
TI: **Can Computers Be Used for Whole Language Approaches to Reading and Language Arts?**
PY: 1988
NT: 19 p.; Paper presented at the Annual Meeting of the Keystone State Reading Association (Hershey, PA, November 4-8, 1988).
PR: EDRS Price - MF01/PC01 Plus Postage.
AB: Holistic approaches to the teaching of reading and writing, most notably the Whole Language movement, reject the philosophy that language skills can be taught. Instead, holistic teachers emphasize process, and they structure the students' classroom activities to be rich in language experience. Computers can be used as tools for whole language experiences in reading and writing, based on principles of holistic language instruction. Classroom reading should center on children's literature rather than basal stories, and software of popular children's literature is available. Teacher feedback for writing should be provided during, not after, the writing process. For this, computer-based revision and editing programs are available for a wide variety of word processing software, giving feedback on grammar, usage, style, and organization. The transition from oral language to print should be as natural as possible, favoring guided language experience over direct instruction in subskills. Several computer programs allow children to create their own stories on the computer, then read the stories back to the children using voice synthesis. Writing should culminate in publishing in order for children to develop a sense of authorship. Desktop publishing is a key computer-based application for developing this sense of authorship in children. These are only a few of the ways in which computers can be used in the whole language classroom. (A bibliography of information on computers and whole language, and a list of educational software are appended.) (MM)

AN: ED294642
AU: Baxter,-Barbara-C.
TI: **Teaching Basic Writing with Computers.**
PY: [1988]
NT: 10 p.; Paper presented at the Southeastern Conference on English in the Two-Year College (Louisville, KY, February 18-20, 1988).
PR: EDRS Price - MF01/PC01 Plus Postage.
AB: Before undertaking a computer-assisted composition class, several factors should be considered. First, there will be demands on the instructor to replan the entire course to include the effective use of computers; to teach fundamental word-processing skills in addition to writing skills; to develop enough knowledge of hardware and software to solve minor problems encountered by students; to compensate for new problems in student writing caused by the use of unfamiliar word-processing programs and machines; and to monitor, assist, and schedule out-of-class lab time in addition to class time. The use of computers also places extra demands on students by disrupting their accustomed methods of composing, placing increased demands on short-term memory, and requiring additional out-of-class lab time. By careful advance planning, familiarizing themselves with the lab and the equipment, adjusting teaching and learning styles to the environment, carefully choosing a word-processing program, and enlisting the help of a lab assistant or a colleague, instructors can alleviate many of these potential problems. While computers can be used for programmed grammar instruction, they are more useful for editing and correcting papers and in the writing stages of invention, development, and organization. Computer-assisted instruction may not be successful with every student, but it does provide alternative learning strategies for some students who are resistant to conventional writing instruction. (MDB)

AN: ED293130
AU: Tone,-Bruce; Winchester,-Dorothy
TI: **Computer-Assisted Writing Instruction. ERIC Digest Number 2.**
CS: ERIC Clearinghouse on Reading and Communication Skills, Bloomington, IN.
PY: 1988
NT: 4 p.
PR: EDRS Price - MF01/PC01 Plus Postage.
AB: Reports in the ERIC database have found that computer-assisted writing instruction has some effect--if not a dramatic impact--in both the quantity and quality of student writing. Although computers

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are becoming more common in schools, the influx of computers into schools may not assure students ample opportunity to use them. Limited time-on-task may be one of the reasons. However, the computer will almost certainly become more and more a part of the lives of students, whatever the limits of the experience they have in using computers in school. The computer's great advantage for writers who know how to compose on one is its facilitation of revision. (Twenty references are included.) (JK)

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